

Successful Methods

Construction - Road Making - Engineering - Industrial - Mining

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Successful Methods of a Bygone Day—An Aqueduct in Brazil More Than 150 Years Old.

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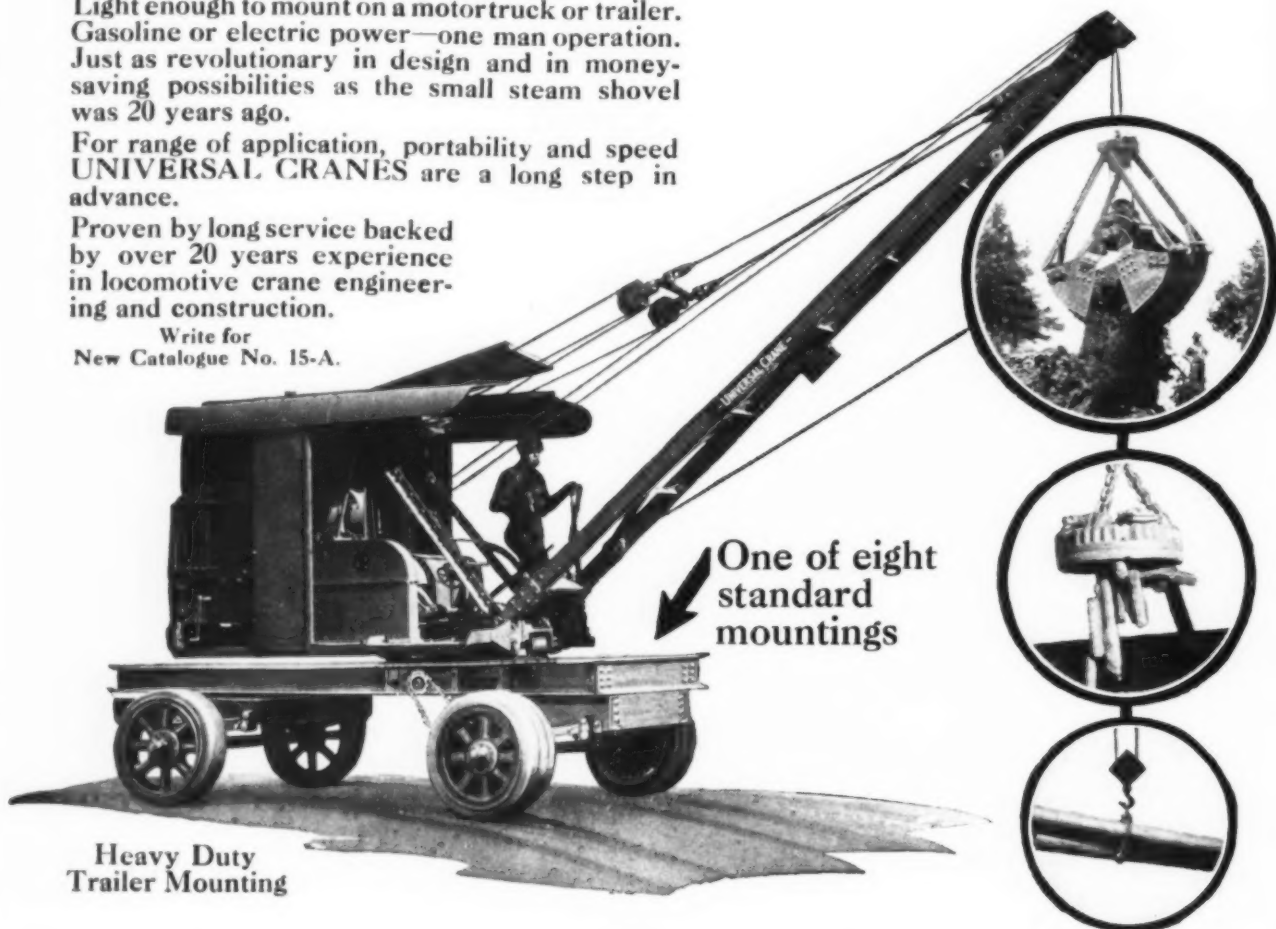
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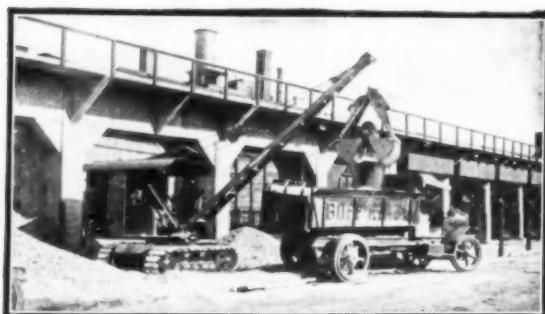
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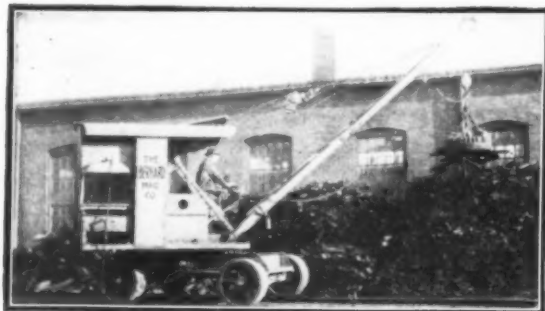
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Successful Methods

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MARCH, 1922

No. 3

The Sap Has Begun to Rise

THIS is the time of year when a lot of things begin to happen. Under the bark the sap has started up. In some sections of the country there will be quite a bit of cold weather yet. But inside the trees the 1922 season has started in full force. The leaves will be here now before we realize it.

Indoors all over the country construction men also have started their 1922 season. The wise heads have ordered their materials and machinery for delivery when needed. They are not taking chances that they can step out later and get what they want on a few days' notice.

Nature plans things so there is no delay at the critical time. The sap never holds back when it is due to rise, even though the frost is deep in the ground. The buds and the leaves are never delayed because the sap waited for more favorable conditions.

Few men seem to take these simple teachings of Nature seriously to heart. They figure they can beat every combination going. This year they expect to save money by buying later at lower prices. They are playing against stacked cards, with a coal strike coming the last of this month, just when construction material producers and machinery manufacturers will be swamped.

Reports that have come in the last two or three weeks show that an unusually large number of buyers have realized what is in the air.

Are you sure that you have the situation sized up right? Are you certain that you will get deliveries so that you can go right ahead as soon as the weather will permit?

Successful Methods of 150 Years Ago

THIRTY-FIVE years before the Battle of Bunker Hill, a seven-mile masonry aqueduct was put in service to deliver a water supply to the City of Rio de Janeiro, Brazil. This project undoubtedly comprised the most important municipal water supply in the western hemisphere at the time. Some features of it are described and illustrated in an article elsewhere in this issue.

No record has been found of the methods used by the old builders. The results they got show that they were master masons. They undoubtedly obtained these results with only the crudest of hand tools. They also had to depend entirely on African slave labor that was not much better than savages. They

evidently used so much care and such ability in designing and supervising the job that the old masonry laid in lime mortar stands to-day with every evidence of being good indefinitely.

What a lesson can be learned from these old builders. They didn't harp over their inability to get results because "No. 2 compressor is out of commission;" nor because "our cement is not good." They just stepped in and did the job to a queen's taste.

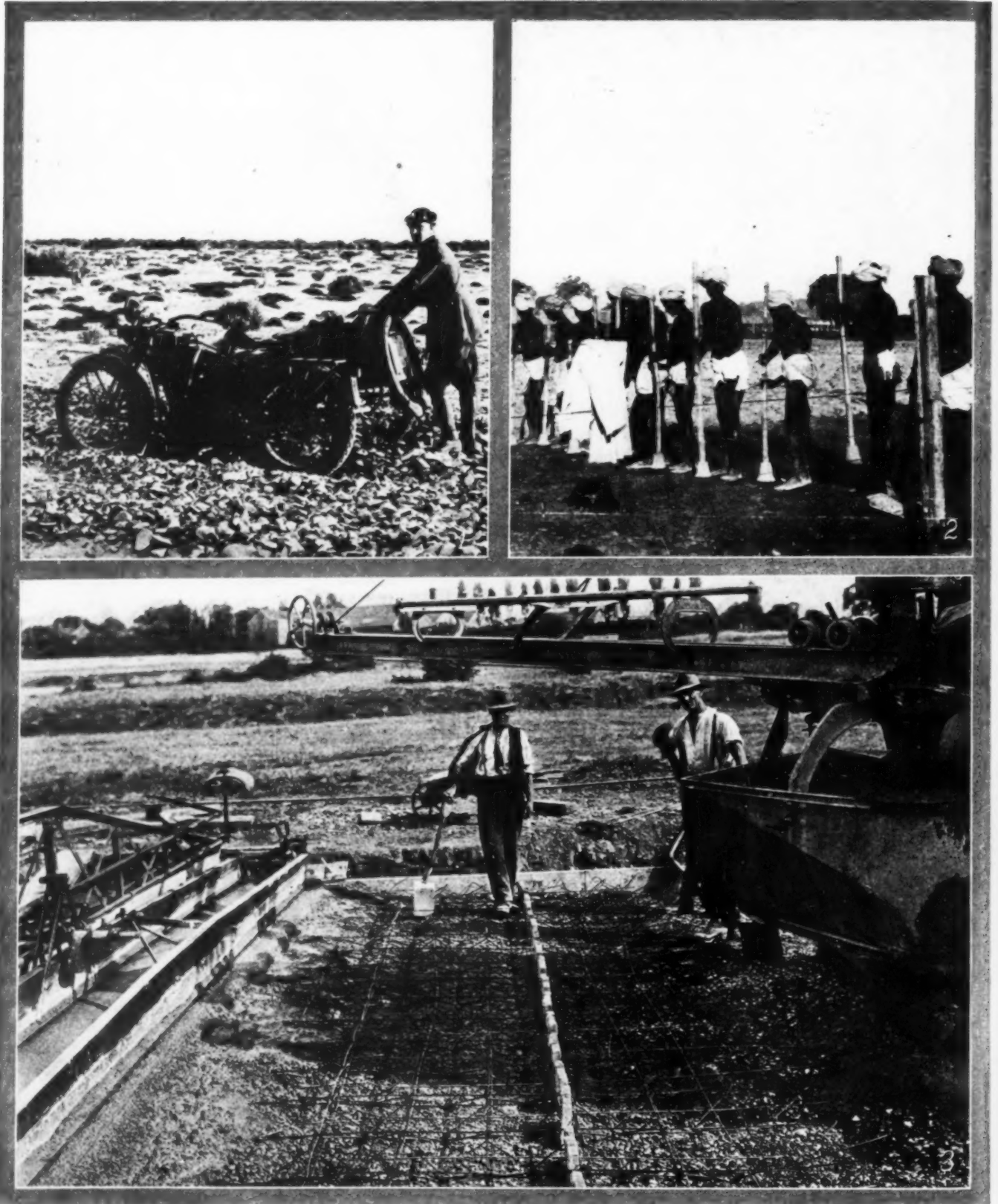
We cannot go back to these old conditions. No one wants to. But a whole lot of foremen and superintendents could save themselves and their bosses a world of worry if they would use more of the kind of care and horse sense that these old Portuguese did back in the time when New Orleans was a Spanish frontier post and the Middle West was an absolute wilderness. Pride of accomplishment must have been a big factor then. We need more of it nowadays, and less of the hasty methods of war times which are still too much in evidence in all lines of industry.

Good Tools

DID you ever try to chop wood with a dull axe? This sounds like a foolish question, but it is astonishing to find how few construction executives ever reduce their new equipment problems to such a simple comparison. Of course, most of our really successful builders just either naturally know how to check up such matters, or have been forced to do so by experience. Go through the rank and file of field bosses, however, from the foremen up. It may appear surprising to find how few of them appreciate the difference in the cost of doing work with inefficient equipment, as compared with the costs obtainable with equipment that was properly selected and is kept in good condition. They struggle along as best they can with old machines that have outlived their usefulness, and do not seem to realize the time and money that are being wasted. They just accept the situation "as is" without complaint.

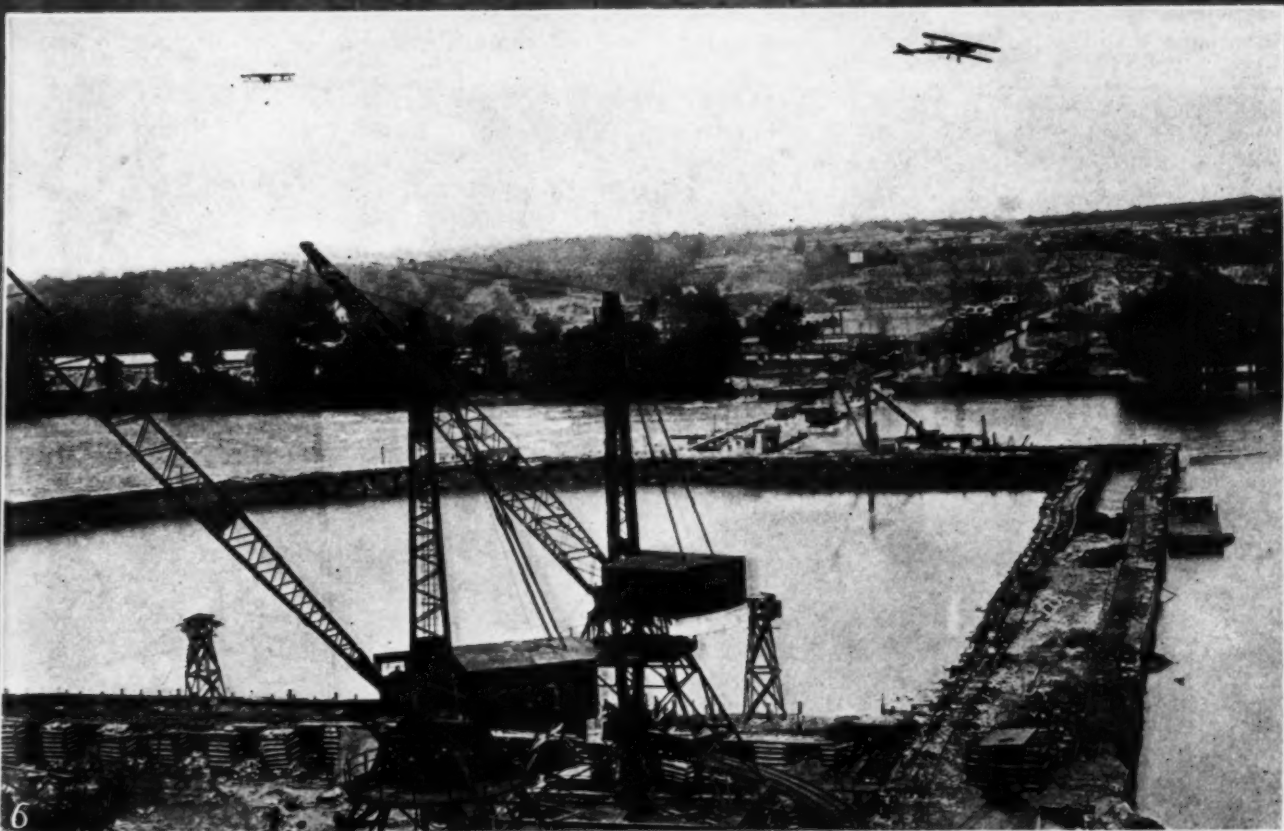
This situation is not so surprising when it is analyzed a little bit. Methods have changed very fast in recent years. New tools and machines are coming into the market continuously. Some are flimsy, crude, badly designed and wholly inefficient. Still they sell in great quantities. Maybe it's because "there's a sucker born every minute." Anyway, not much of such stuff remains in service long on jobs of successful concerns.

Both Land and Water



- 1—Mexico is building a national highway. This photograph shows that at least a beginning has been made. © Keystone
2—Road building in India is a tedious process. © International.
3—American machines are building roads in England. This photograph shows the construction of a concrete road in North Hampton County.

Make Work for Builders



4—This recently completed lighthouse is in the biggest city in the United States. It is on the rock-bound shore of Manhattan Island. © Keystone Views.

5—Holland is reclaiming the Zuyder Zee. This photograph shows the start of the gigantic project. © Keystone

6—The famous Wilson Dam at Muscle Shoals, at present the most talked of job in the country. © Keystone

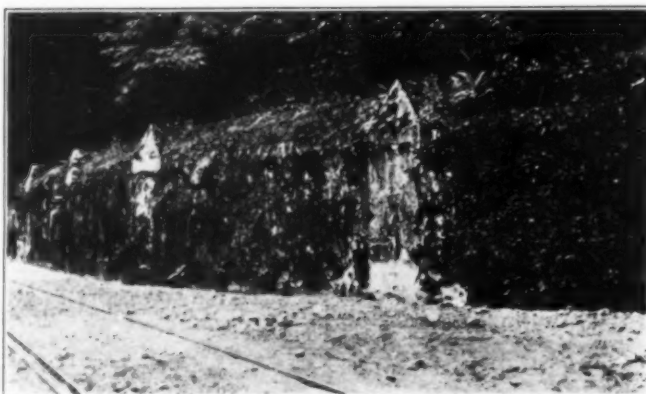
AN ANCIENT AQUEDUCT IN BRAZIL

Built by Portuguese More Than 150 Years Ago, It Was Used Until Recently

By S. T. HENRY

ABOUT 150 years ago the Portuguese built a seven-mile masonry aqueduct to deliver a water supply for the city of Rio de Janeiro, Brazil. This aqueduct was continuously in service until a few years ago, when it was superseded by a modern pipe line. All of the aqueduct, except some sections that have been removed recently to make room for a roadway, remains in a remarkable state of preservation. Certainly the old Jesuit monks, who directed the building of this aqueduct, left a great monument to their engineering ability and their constructive skill.

For practically all of its seven-mile length the aqueduct was located on a bench cut in the side of steep mountain slopes. One of the accompanying photographs gives a typical view of the aqueduct along this bench location. Attention is called specially in this photograph to the tropical vegetation and mosses



A TYPICAL VIEW OF THE OLD AQUEDUCT

growing on the smooth face and top of the aqueduct.

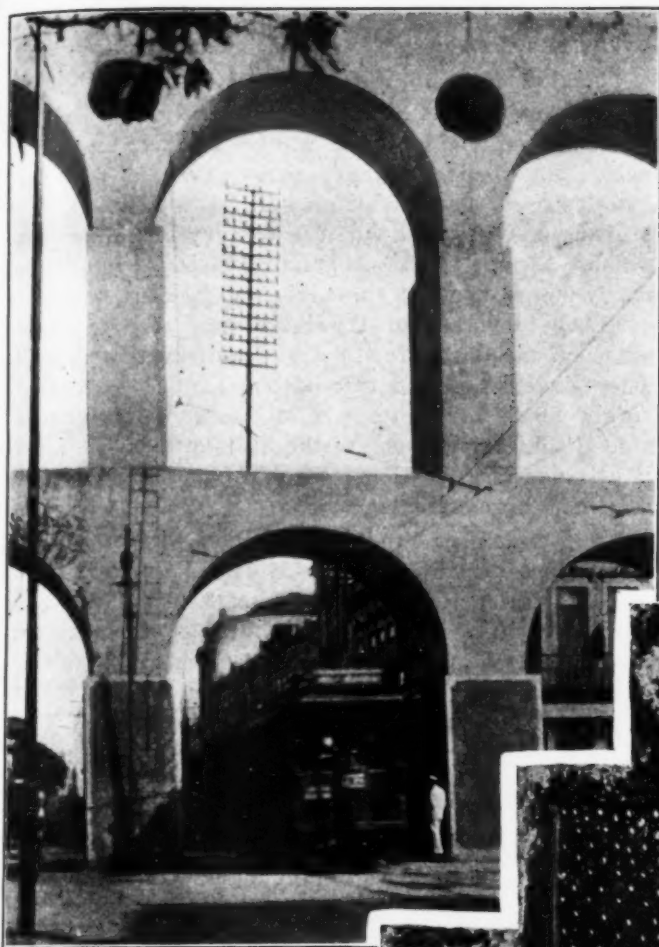
The water-carrying conduit of the aqueduct consists simply of a trough, as shown in the photograph that gives the typical section of the masonry. This trough is about 18 in. wide at the top, with straight sides and a curved bottom. The section of the trough indicates that the designers

had a good deal of knowledge of the theory of the flow of water in a conduit.

The trough was hewn out of solid blocks of a very tough stone. Two of these blocks are shown in one of the photographs, which was taken after the blocks had been removed from the structure. The stone blocks varied from 3 to 7 ft. in length. They were of uniform width and height, being approximately 3 ft. wide and 2 ft. 6 in. in height. The bottom and both sides and both ends of the blocks were hewn to



TWO OF THE HEWN STONE CONDUIT BLOCKS



THIS PHOTOGRAPH GIVES A GOOD IDEA
OF THE HEIGHT OF THE DOUBLE DECK
ARCHES

remarkably straight, smooth surfaces. A flat, U-shaped groove about 1 in. deep was cut in the ends of the blocks, the grooves in each two abutting ends making a fit. Into the space thus formed a grout was forced in some manner so as to make a tight joint which held the blocks in line. The blocks also were very firmly bedded, so as to prevent unequal settlement.

The trough was lined with well-burned terra-cotta tile in random lengths. These tile were laid so as to overlap the joints between the stone blocks. They also were set in mortar with admirable care and exactness to form an almost perfect alignment. In the block to the right in the picture the tile has been removed so as to show the accuracy of the mortar bedding. The terra-cotta tile lining can be seen fairly well in the block to the left in the picture.

Apparently the side walls and the arch of the structure, as shown in the photograph of the typical section, formed only a covering to protect the conduit and the water carried by the latter. As seen from the outside, the walls of the structure appear to be smooth, solid concrete. When torn down, however, they proved to be rubble masonry laid up in lime mortar. These side walls rest on the ground, entirely independent of the blocks.

The side walls carry an arch made up of a single course of brick roughly laid in lime mortar. This arch is plastered on the outside so as to form a smooth,

peaked roof to the structure. The line of this roof slope joins to the line of the side walls in a manner which secures a remarkably pleasing architectural effect.

At intervals of from 30 to 60 ft. along the aqueduct pilasters are built into the structure, as is shown clearly in two of the photographs. Surmounting each pilaster is a gable in which there is located a simple little iron ventilator.

One of the photographs shows one of these iron ventilators. Each ventilator is one solid piece of old-fashioned puddled iron. The three projecting prongs shown in the photograph serve as anchors to hold the rectangular frame in the masonry. The thinner sheet within the rectangular frame contains numerous irregularly placed small holes which were evidently hammered through this section while the iron was hot. In fact, the whole ventilator appears to have been hammered out by hand.

After 150 years of exposure in the tropics the corrosion on the surface of these old iron ventilators can be scraped off easily with a pocket knife. There is no pitting. It may be that the old-timers did not know how to make some of our wonderful modern steels. They did know much, however, about making real iron which was practically proof against corrosion.

AT THE LEFT IS ONE OF THE IRON VENTILATORS USED IN THE AQUEDUCT
BELOW IS A TYPICAL SECTION OF THE MASONRY



Several openings into the structure were protected by iron gates. These gates were made of the same class of material as the ventilators. They were undoubtedly hammered out by hand and made accurately to size and shape. Those that remain in place are still in excellent condition. The hinges of the gates were anchored in stone blocks set in the masonry by means of lead that appears to have been poured hot and caulked into place.

The design and the wonderfully skillful workmanship of the old Portuguese masons were combined to give a general effect to the structure that we in our modern works rarely ever secure. Great care evidently was used in placing every stone in the aqueduct. Legend has it that the lime mortar was mixed with fish oil instead of water. Various other mysterious methods were supposed to have been used by the builders.

When sections of the aqueduct were being destroyed in 1920 the workmen ripped the masonry apart easily with crowbars and hoes. (The Brazilian rarely ever uses a pick or shovel, but he can throw loose dirt 15 ft. to 20 ft. with a hoe.) For hundreds of feet the alignment of the walls of the aqueduct was perfect. The plaster finish on the inside and the outside was as smooth and as uniform as the day that it was applied. If there was any mystery in the construction it lay in the skill with which the masons had protected the crude masonry with a lean lime plaster coat that was mixed and placed so that it had defied the tropics for over a century and a half. To all appearances this plaster coat will be good indefinitely where it has been undisturbed.

Near the lower end of the aqueduct a valley is crossed on a masonry viaduct having 42 double-decked arches. On the front cover of this issue is a view showing part of this viaduct. One of the accompanying photographs gives an idea of the wonderful symmetry

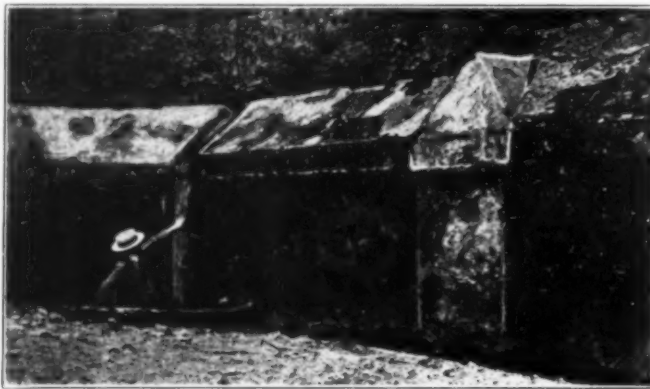
of the arches. This picture also shows the comparatively thin sections of the piers carrying the arches.

The viaduct was built wide enough to carry a single-track roadway. Its designers doubtless never thought of anything heavier than a two-wheeled mule cart using this roadway. For years street railway cars have crossed the viaduct on a single-track line. Not a crack has shown up in the wonderful plaster coat finish. No one in Rio de Janeiro could be found who really knew of what the arches were built. Almost certainly they are of the same lime mortar rubble or brick masonry of which the aqueduct was built. They have stood the test of time and have carried safely loads far in excess of those they were designed for, simply because the builders had the know-how which enabled them to get the most out of crude and inferior materials.

From end to end the old aqueduct has many noteworthy engineering features of design. After watching the destruction of a large part of the aqueduct over a period of several weeks, these engineering features assumed little importance as compared with the skill that the builders must have used.

The huge blocks of the conduit base were hewn and placed with an accuracy that was an inspiration. The terra-cotta tile lining of the conduit was set as carefully as the pattern of an inlaid table. The rough stones of the side walls and the irregular, misshapen brick in the arch were brought together with the lean lime mortar to make a finished job which would rival the very best of our present-day works in concrete.

And all this was done with slave labor, in a dense tropical jungle far removed from the civilization of the day and with the crudest of hand tools. What workmen those old priests must have been! What a monument to the constructive skill of their day they left!



JUST ABOVE THE MAN'S HAND IS ONE OF THE GUTTERS MADE TO CARRY THE STORM WATER OVER THE AQUEDUCT

ROADBUILDING METHODS IN ILLINOIS

SOME statistics compiled by B. H. Piepmeier, Engineer of Construction of the Division of Highways in Illinois, gives a picture of last year's road construction record in that State which will be of interest to all those interested in highway development.

No work was done before April last year and the greatest number of days any one paver was operated was 129. The peak was reached in August and again in October. Two pavers were operated 121 days, two 105 days and the remainder of the 102 which were at work in the State less than 100 days. From these records Mr. Piepmeier reaches the conclusion that it

is safe to set 120 days as the maximum road construction season in Illinois.

Of the 102 paving mixers operating, 20 were charged by means of industrial railway equipment; 34 by central proportioning plants with truck delivery; 12 by central mixing plants with truck delivery; 8 from large storage piles upon the highway, and 28 from materials stored upon the subgrade. During 1922 the specifications will not permit material to be stored on the subgrade and the jobs on which it was permitted last year were in nearly every case left over from the previous season when the practice was still in favor.

CONCRETING IN FREEZING WEATHER

Canvas Coverings and Salamanders Keep Temperature Stable for 72 Hours After Pouring on Bridge Job in Indiana

"**E** L I M I N A T I N G the construction season," or in other words carrying on construction work, wherever possible, regardless of winter weather, is becoming more and more the general practice. The Indiana State Highway Commission recently completed a double 55-ft. span pony truss bridge on State Road No. 3, just west of Lewisville. The bridge has a concrete floor slab, and concreting of the west span floor was done on a day this winter when the temperature was between 30 and 40 degrees.

It was the time of year when cold weather could be expected and arrangements were made to protect the concrete for 72 hrs. after pouring. Large canvases were suspended from each truss and the lower edges staked to the ground. Salamanders on platforms over the water and fires on the banks were started before any concrete was placed.

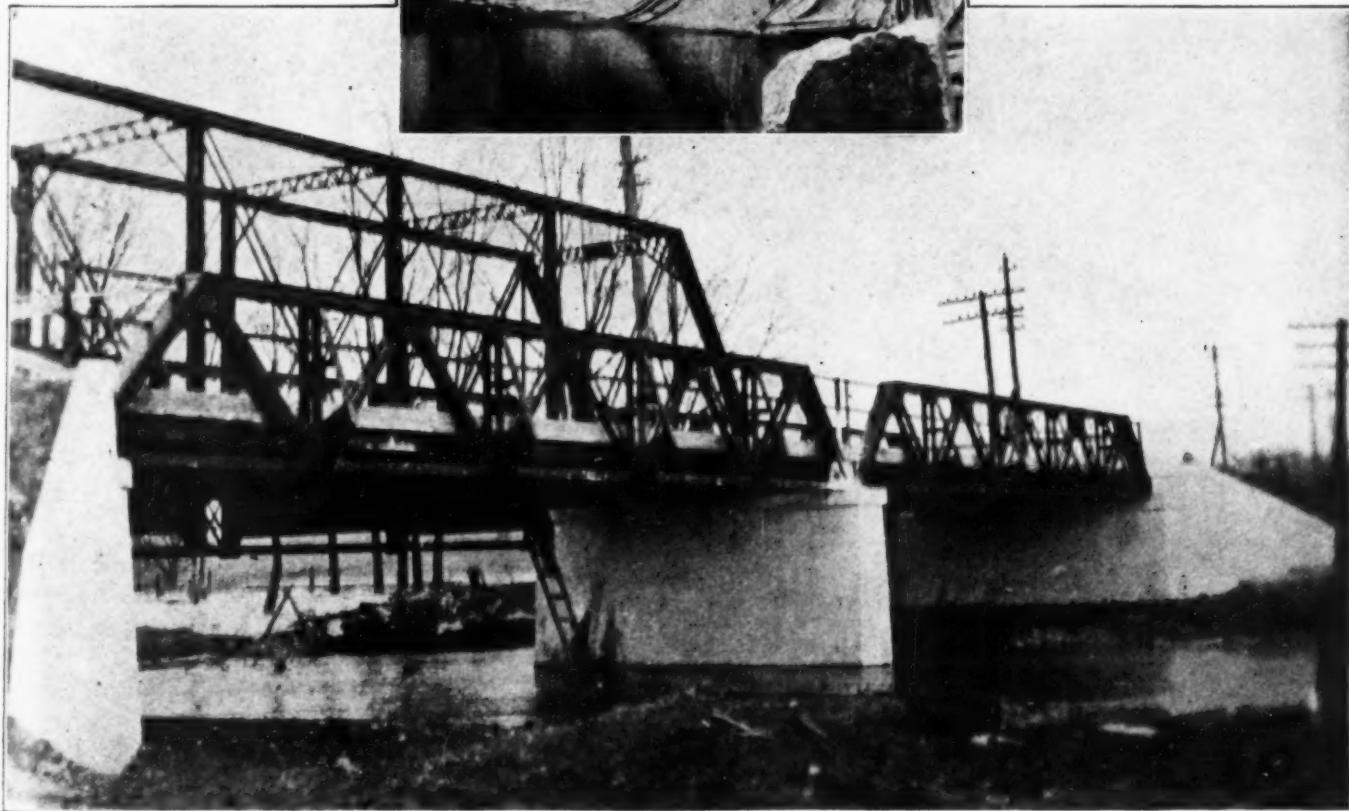
An average temperature of 60 degrees was maintained 6 in. below the floor slab form within the enclosure formed by the canvases and the floor form for 72 hrs. after the concrete was poured. Arrangements were made to supply additional canvases across the

top chord of each truss completely housing the structure should the weather require it. This was not necessary, however, but twelve hours after the concrete was poured a layer of straw 1 ft. thick was placed on the floor slab. The illustrations show the canvases in place, as well as the completed structure.

Contractors, before deciding to postpone their operations until spring should consider possibilities of winter construction, which has numerous advantages. Labor is more plentiful and more willing to give a full day's work. Building materials are slightly lower in cost. In northern climates, where cold weather is continuous for some time, bridge and other classes of

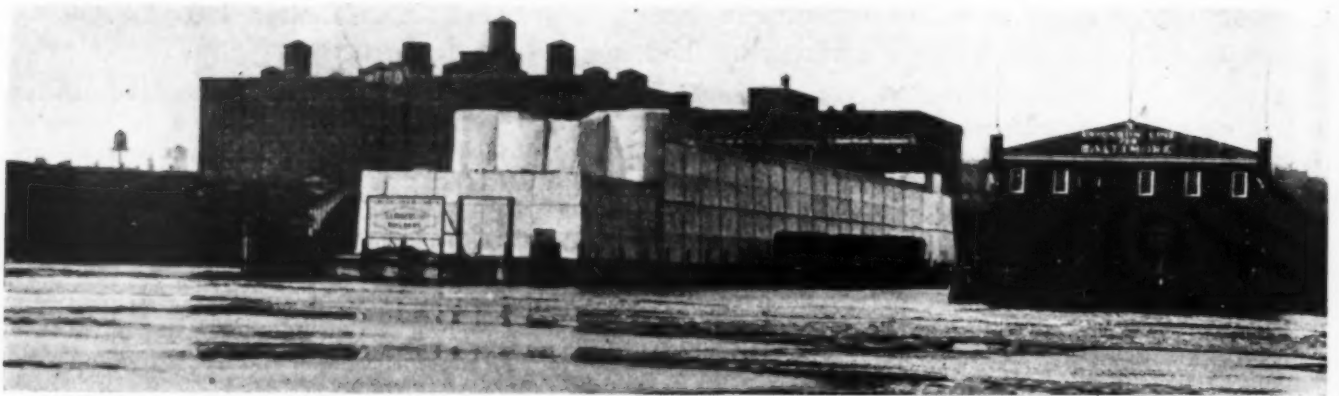
construction may actually be facilitated by frozen stream conditions or the absence of running water. Well known construction companies doing winter work especially concrete have found that these advantages neutralize to a large extent the disadvantages incident to winter conditions.

W. R. Britton was Field Engineer in charge of the construction of the structure for the Indiana State Highway Commission.



THE PIERS SHROUDED IN CANVAS ARE SHOWN IN THE UPPER PHOTOGRAPH. THE LOWER PICTURE SHOWS THEM JUST AFTER THE COVERINGS WERE REMOVED

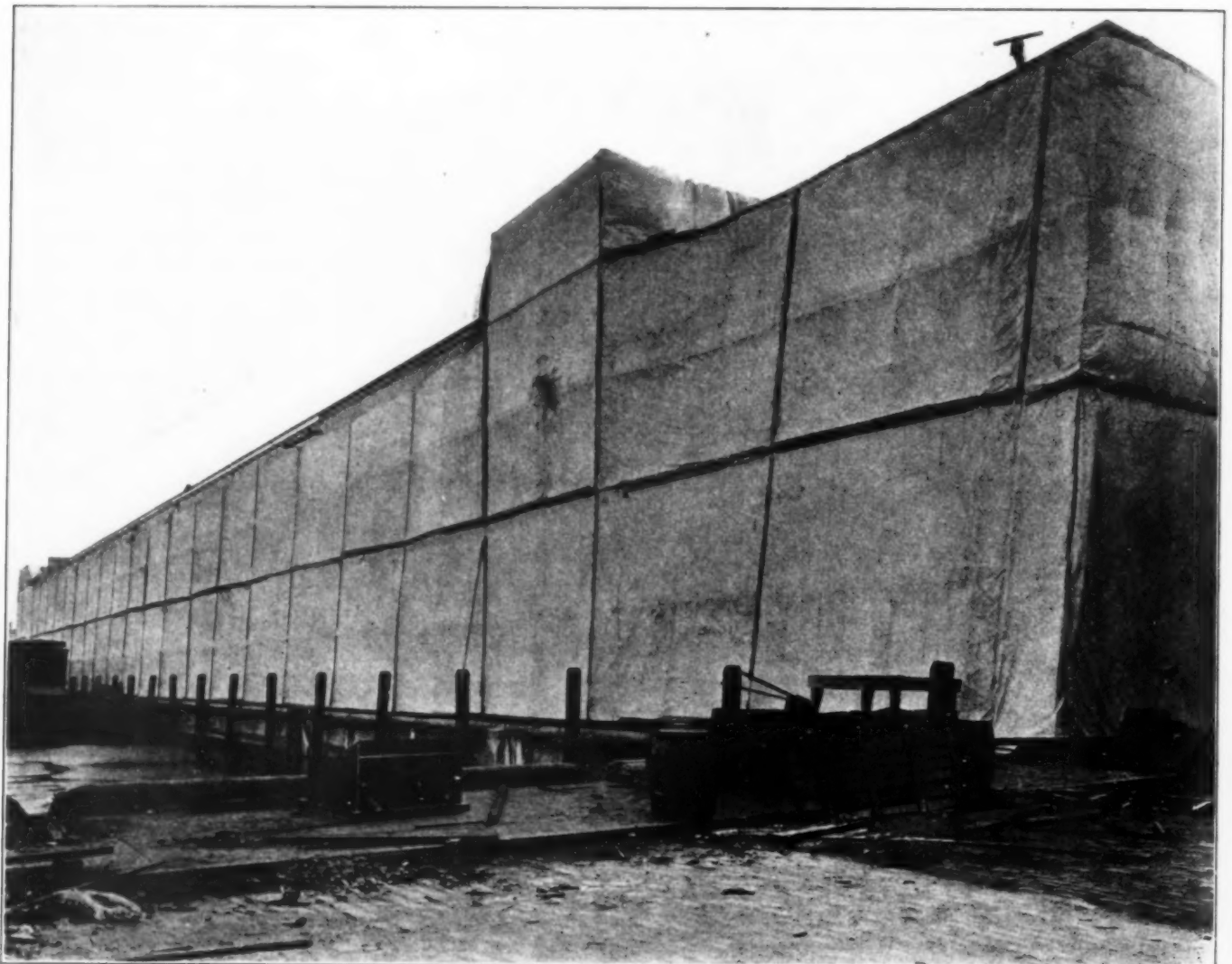
CANVAS COAT FOR BIG PIER



Philadelphia Contractors Cheat Storms by Completely Covering Structure with White Duck

WHEN the snow storm of January 29th, which buried Washington, Baltimore and Philadelphia under about 18 in. of snow occurred, practically all classes of construction work were put out of business with possibly one exception. Work on the

erection of a 2-story steel shed 70 ft. by 550 ft. on Pier 4 South, in the Delaware River, which is being constructed by the J. S. Rogers Company, Philadelphia, was not interrupted by the storm. The entire pier, as shown in the accompanying photographs, was com-



THE TWO PHOTOGRAPHS SHOW THE 550-FT. PIER COMPLETELY SWATHED IN CANVAS.

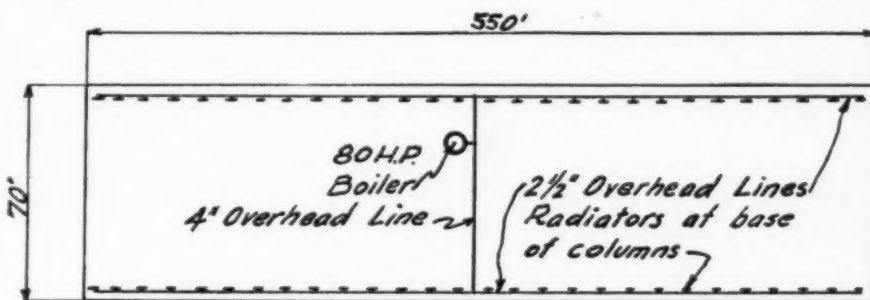
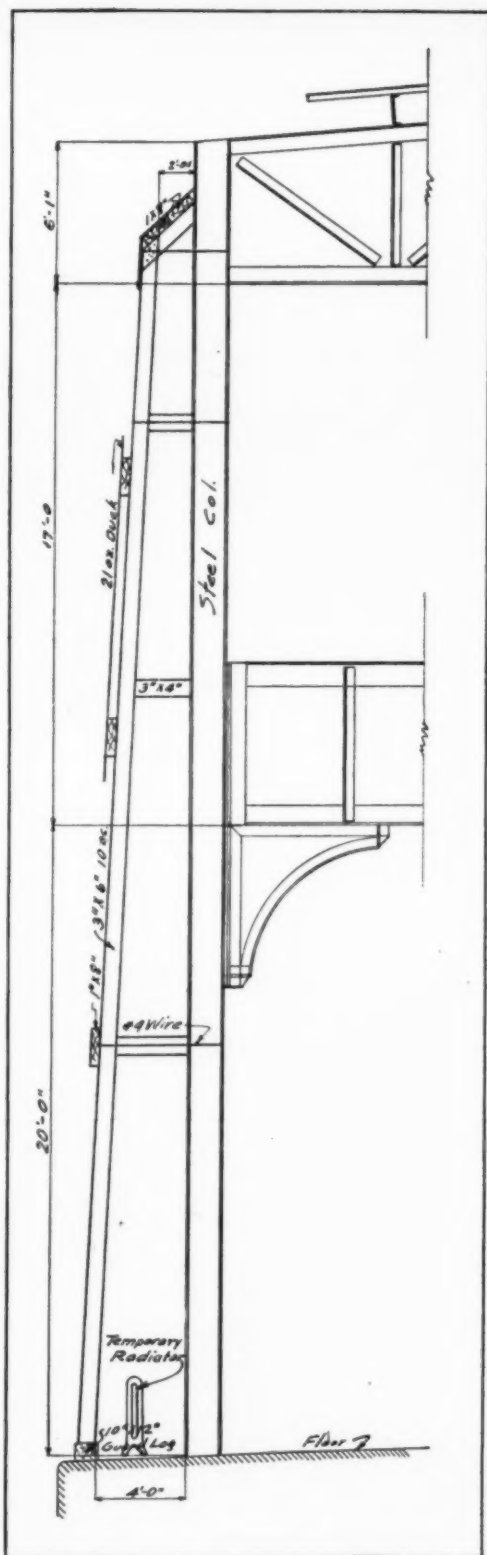
pletely inclosed under 50,000 sq. ft. of canvas.

A section through the side wall which appears on this page shows the frame work for supporting the canvas. Three by 4 spreaders or struts were placed against the steel columns and 3 by 6 uprights were wired to the columns as shown. The canvas was made fast to the 3 by 6, by means of canvas ties on 4-ft. centers, and horizontally by means of gauntlet holes on 2-ft. centers. Twenty-one-ounce white duck was used and the resulting decrease in the lighting of the interior is surprisingly small. The erecting of the framework and the hanging of the canvas was done by 20 carpenters and 10 laborers working 2 full weeks of 8-hr. days.

With the exception of the offset in the roof in the third bay, as shown in the lower illustration on the opposite page, the 2-in. roof sheathing was placed in advance, the canvas being fixed to the steel column over 1-in. boards as shown at the top of the diagram. Great care had to be taken in attaching the canvas so as not to interfere with the roofers or the men placing the eaves, flashing, gutter and downspouts.

For the bottom support of the framework, the ground log, which is a 10-in. by 12-in. timber 4 ft. from the columns and running the entire length of the pier, proved ideal. The space was sufficient and the masons had no trouble in doing their work. The bays being 20 ft. and the height 40 ft., the 20-ft. by 20-ft. sections of canvas were exactly what were needed. Both sides, as well as the river end, were covered in a similar manner. On the outside, nailing strips nailed to the ledgers and uprights at the columns, as shown in the photograph at the bottom of the opposite page, were used.

Inside this canvas inclosure, a steam heating plant was set up. At each column



ABOVE—SECTION SHOWING FRAMEWORK ON WHICH CANVAS IS HUNG.
BELOW—HEATING LAYOUT.

(columns on 20-ft. centers) radiators were placed between the canvas and the wall as shown in the small sketch at the bottom of this page. These radiators, having 100 ft. radiation, were fed by one central boiler of 80 hp. capacity. The piping from boiler to radiators is shown on the sketch. By means of this system, it was possible to maintain a temperature within the canvas of 35 degrees higher than that on the outside during all kinds of weather.

Within a day or two after the work of hanging the canvas was completed cold weather set in and continued for several weeks.

The big blizzard caused absolutely no interruption to the work, and this is believed to be the only job in the vicinity of which this can be said.

The illustration at the top of the opposite page which was taken from the river, shows the pier shed entirely inclosed. The lower photograph gives a close-up showing how the canvas was made fast in 20-ft. sections.

It is interesting to note that from January 25, the time when the canvas inclosure and heating plant were completed and put in operation, not a single day has been lost and a working force of over 100 men has been able to work without interruption throughout.

In the January issue of SUCCESSFUL METHODS a description of the method used to erect steel on this job was given and the contractors exerted every effort to get up the steel framework before winter set in. Inasmuch as their contract calls for an early completion of the pier, and as no masonry work is permitted when exposed to temperature lower than 36 degrees, the method of entirely inclosing the work was decided upon.

The results are highly pleasing and satisfactory.

The entire second floor will be used to house the offices of the Department of Docks of the city of Philadelphia.

PHILADELPHIA DIGS ITSELF OUT

Efficient Snow Fighting Organization Stands Up Under Severe Test

ON January 29th a snow storm tied up the East, causing many deaths and wreaking havoc generally. The City of Philadelphia was buried under 18 in. of snow, and the Street Cleaning Department had its first opportunity to test its snow fighting organization and equipment. Months before a complete organization plan had been worked out for the season so that every man of the snow fighting forces knew where he was to report and the duties he was to perform. Each piece of equipment had been assigned to the work which it was to do. The addresses of the force are all a matter of record, so that the men can be reached by phone or by the Police Department any time during the day or night. The chart shows the assignment of work, dump locations, etc., in the central districts of Philadelphia. That the thoroughness with which the snow removal districts had been arranged

and the plans which had been prepared were well justified, is appreciated when it is understood that in the removal of the snow of January 29th, over 2000 men were employed and the cost was in the neighborhood of \$70,000.



THE RECEIVING END OF THE SNOW LOADER

For the removal of snow in the most congested downtown districts, plows, operating on the principle of a road grader with motor power furnished by trucks and tractors and trolley cars were used to open a path. Snow was then removed by means of motor trucks loaded either by hand or by means of a mechanical loader. One of the illustrations shows a mechanical loader which attracted considerable attention.

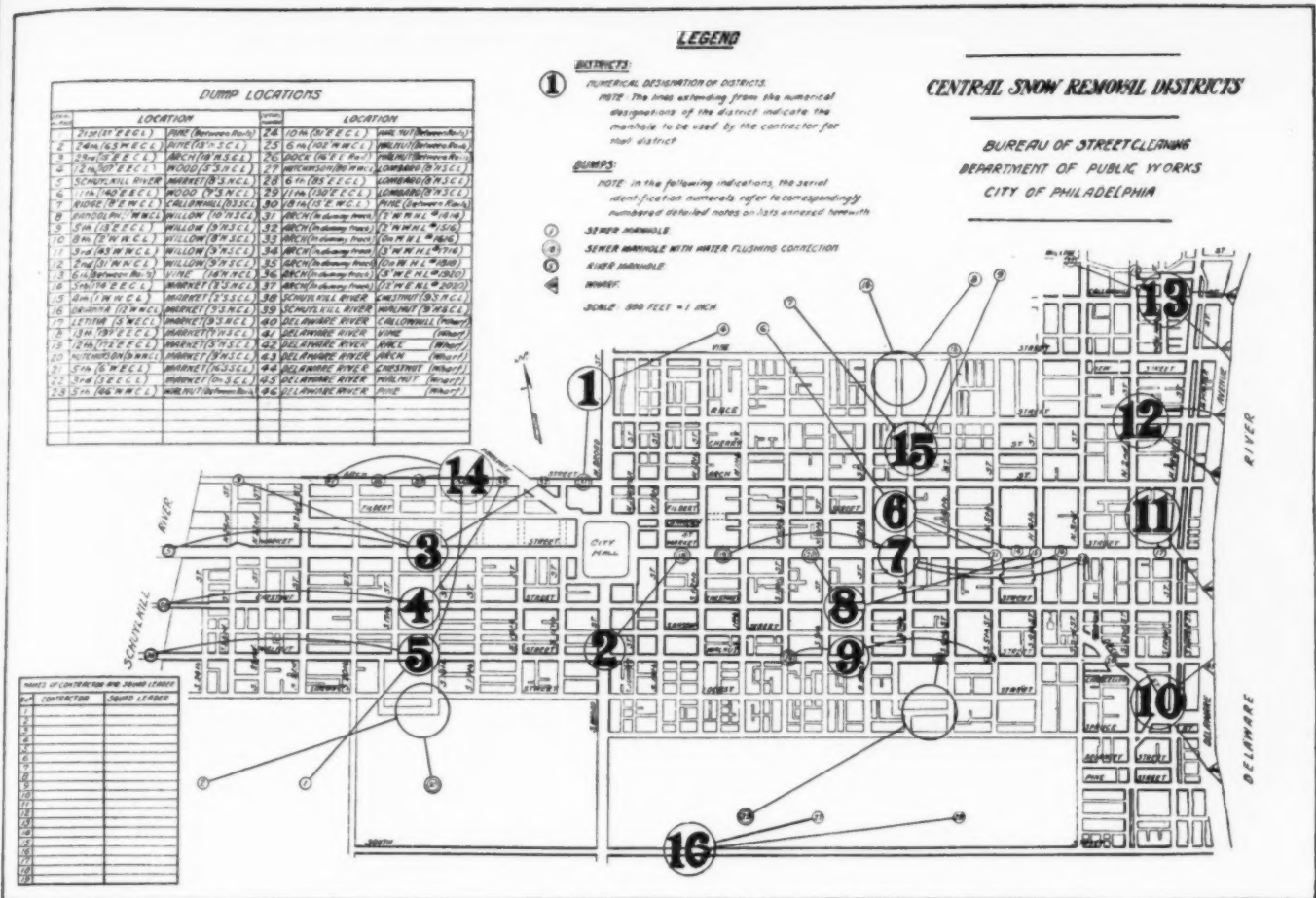
This was the first machine of its type to be used in Philadelphia for snow removal. This machine loaded 5-ton trucks in a minute and a half and averaged 25 trucks per hour. By hand it took 12 men, 20 min. to load the same truck.



PHILADELPHIA'S SNOW LOADER IN ACTION ON A NARROW STREET

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THIS MAP PREPARED LAST FALL SHOWS HOW PHILADELPHIA'S BUREAU OF STREET CLEANING PLANNED ITS SNOW FIGHTING CAMPAIGN

The smaller photograph shows the manner in which the snow is scooped up and fed to the belt conveyor which elevates it and finally dumps the snow into trucks. The machine is run by gasoline and operated by one man. One to three laborers are used to clean up and work with the machine.

The men and equipment are obtained not only from the Street Cleaning Department but from other

municipal departments as well as outside sources. Arrangements are made in advance to borrow laborers from the various departments of the city's forces and their work and location is likewise planned beforehand. In sections of the city more or less remote such forces are used to keep the walks open, and clear spaces in the vicinity of fire plugs. They keep at it until the snow is all gone.

RAILROADS HANDLE WORK EFFICIENTLY

THE railroads of the country are generally supposed to be unable to do construction work as cheaply as can private contractors. Nevertheless the order and general air of system which prevail on a railroad construction job are pretty sure to impress a visitor. The cars or bunk houses occupied by the laborers are generally painted and labeled. Tool houses, tool boxes, etc., are as a rule neatly stenciled, showing the department of the railroad to which they belong. Likewise various pieces of equipment and plant are similarly stenciled. Timekeepers are generally thorough and forces are systematically checked several times daily in the field. Fuel consumed is checked up and engines and boilers are inspected from time to time by others than the operators.

On account of the intermittent nature of their work, contractors sometimes become careless and the practices of the railroads are well worth following.

TOO MANY METHODS ON SAME SORT OF WORK

IN Detroit, Mich., there has been a great amount of sewer construction going on for some time. There are probably a dozen or so different general contractors doing the job, which consists mainly of tunnel work. Although the nature of the soil remains constant, there is as great a variety of methods and machines used as there are contractors. While progress in contracting demands that new methods and machines be constantly tried out, it would seem that there could not possibly exist 12 different methods of tunneling in the same class of soil which would all prove equally satisfactory. In other words, there is no uniform or nearly uniform method of doing construction work. While it is evident that considerable progress has been made when the rule-of-thumb methods of a decade ago are called to mind, nevertheless there is great room for improvement and it is sure to come.

LOADING SKIPS SPEED UP WORK AT ASPHALT MIXING PLANT IN CANADA

Change in Methods Proves Big Time Saver on Road Job

BY IRVING H. PARKER

IN order to supply the demands of the spreading gang and to obtain full capacity of the mixing plant on a 14-mile asphaltic concrete job in Canada continuous mixing at the plant was necessary. Seven-ton trucks, each with a 14 batch capacity, were used to transport

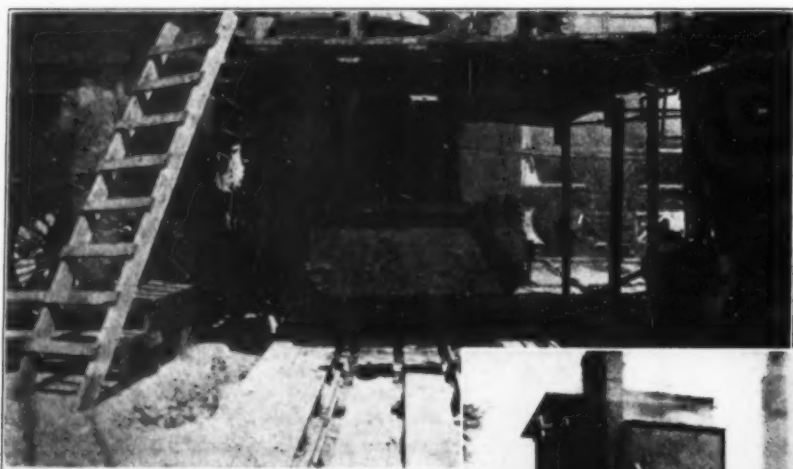
gate opened and the mixture discharged into the truck.

The second skip was handled in the same manner and the truck allowed to depart. Actual mixing time was not shortened but the necessity of backing the truck under the mixing box as shown in the center picture, and holding the truck there until 14 batches were mixed kept the truck idle for approximately 25 min. By the use of the skips the actual loading time of the trucks was reduced to 2 min.

This method has proved the economic value of continuous mixing as a time and labor saver for besides saving the time of the truck it saves the time of an idle gang of plant laborers as well as an idle spreading gang. It also allows the regulation of the drum fires.

In the case just cited, expense was not considered, for production was the object sought. On a small job the loading skip would be an expensive proposition for the services of 2 men are required to push the car holding the skip and to attach and detach the hooks on the loading crane or derrick. The services of the operator and the installation and upkeep of the lifting machinery also must be considered.

As stated above the elimination

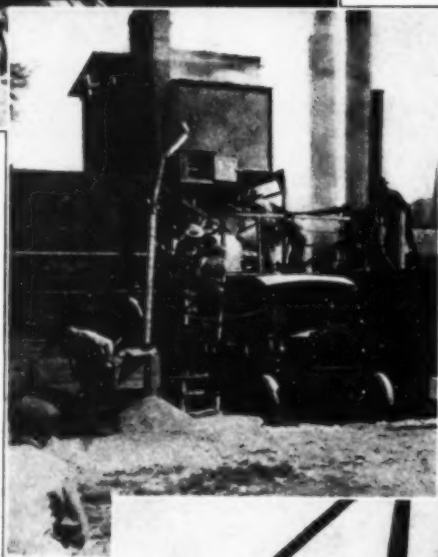


LOADING SKIP UNDER MIXING BOX. IT IS PLACED ON SMALL CAR

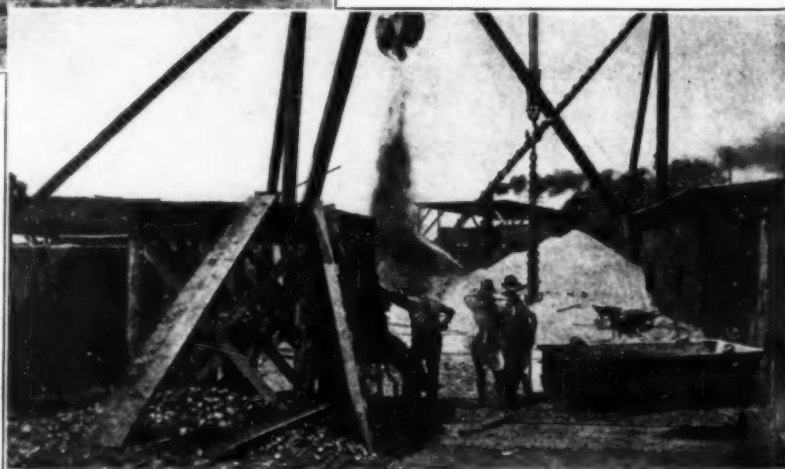
the mixture from the plant to the spreading gang. In order that the trucks should not be delayed at the mixing plant waiting for their loads stone skips such as have ordinarily been used on excavation work were employed.

Two skips, each of 2 cu. yd. capacity, were used. Each skip held seven 1000-lb. batches for asphaltic concrete is denser than loose stone. The skips were loaded while the trucks were enroute so that upon their arrival at the plant the loads were already mixed and the transfer of the mixture from the skips to the trucks required but a short time.

An empty skip was placed on a small flat car which was pushed on a track from a point convenient to the loading crane or derrick to a place immediately under the pug mill mixer. As the batches were mixed the mixer box was opened by a sliding door on the under side and the mixture discharged directly into the skip. The skip, having received its full number of batches, was pushed from under the mixer and raised by the crane to the receiving platform where it was covered with tarpaulin to retain its heat while waiting for the truck. The truck on arrival pulled up close to the platform. The skip was then tipped to an angle of 45 degrees, the end



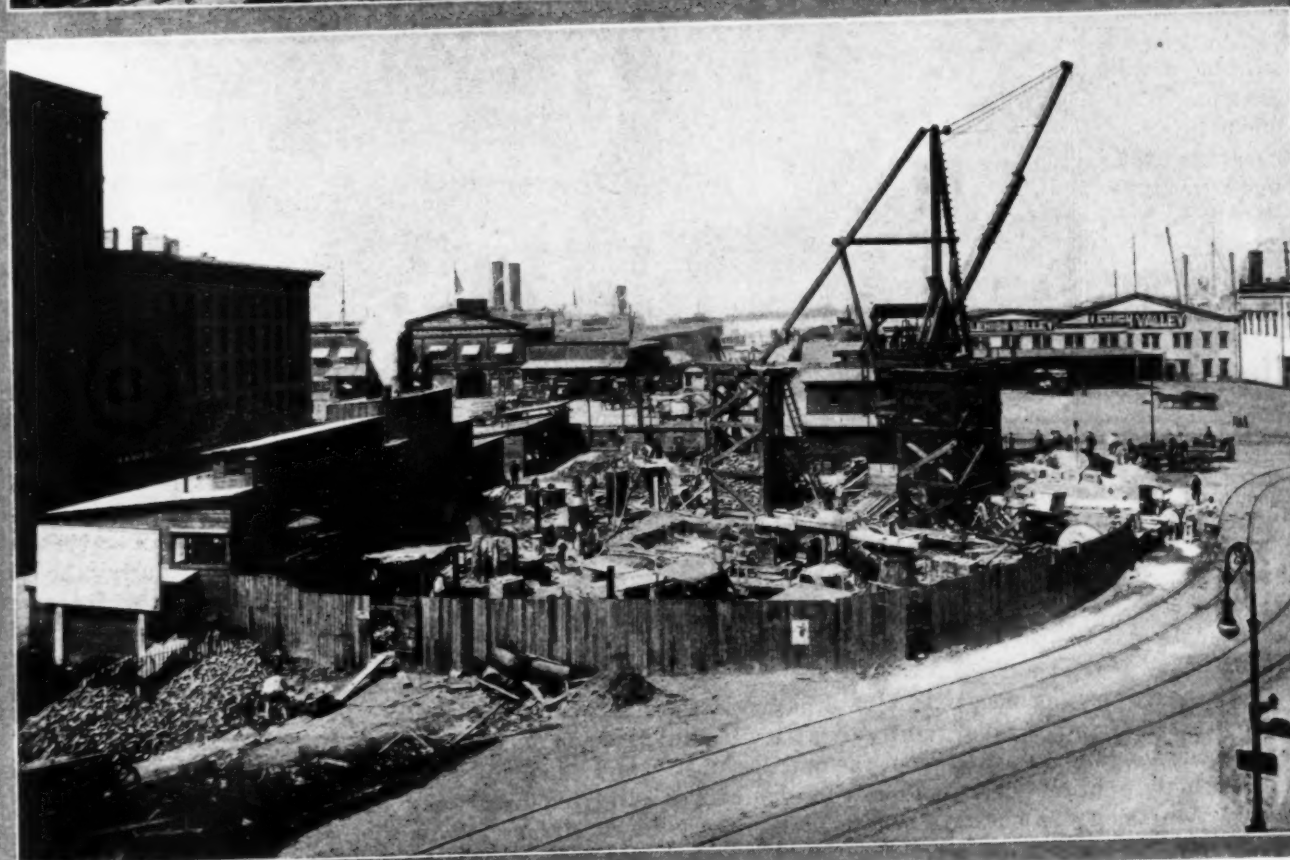
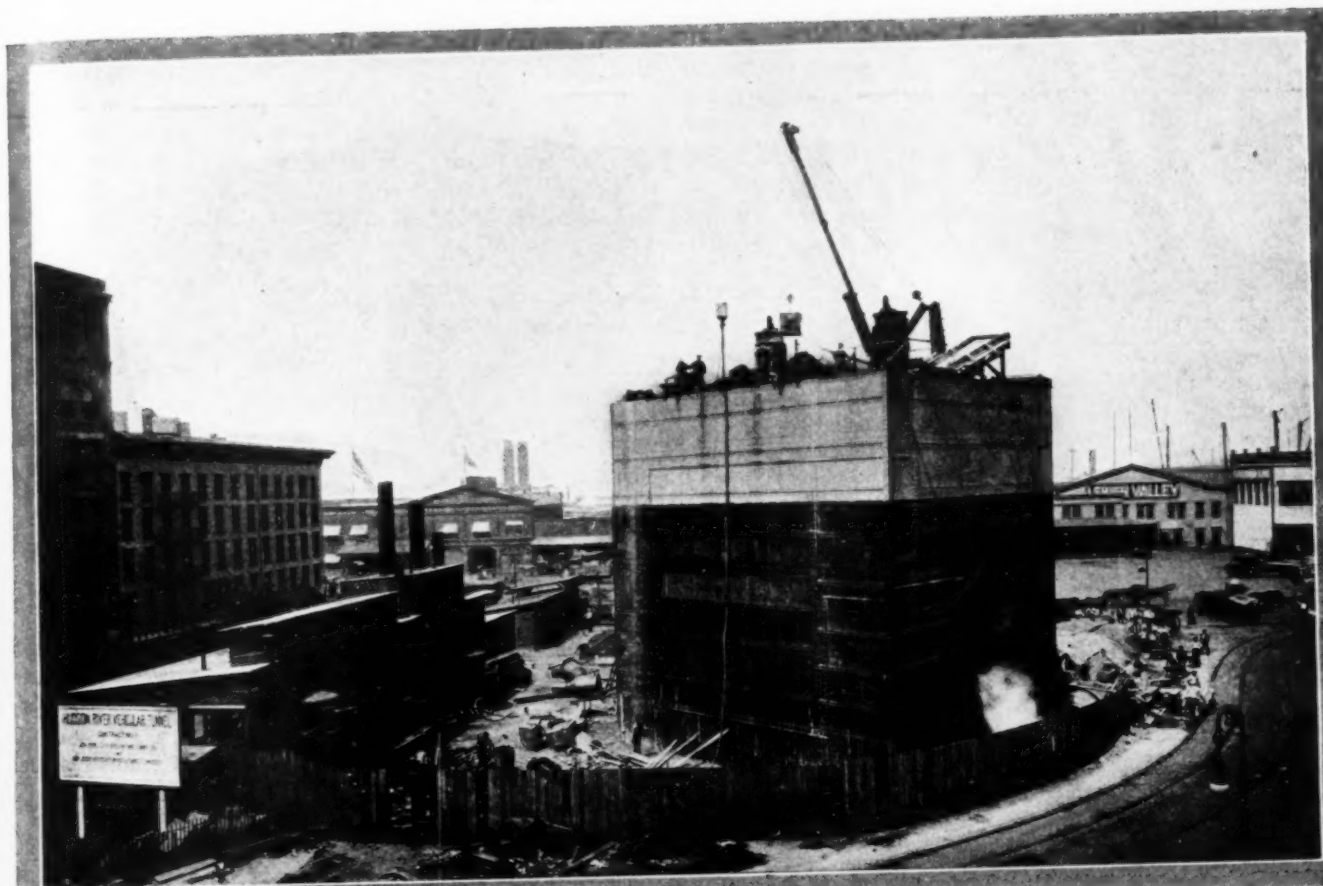
THE CENTER PHOTOGRAPH SHOWS THE OLD METHOD OF LOADING



THE LOADING PLATFORM. EMPTY SKIP HAS JUST BEEN DUMPED INTO TRUCK AND SECOND SKIP IS BEING PUSHED OUT FROM UNDER MIXER

of wasted time on various parts of the job was the determining factor which brought about the change in methods.

Tunneling Under the Hudson



These photographs show two stages of the construction work on the vehicular tunnel being built under the Hudson River to connect New York and New Jersey. In the upper photograph is shown the giant caisson at the foot of Canal Street ready for sinking and the lower photograph shows the site of the work after the caisson had been sunk to its permanent position 64 ft. below. These photographs were taken at the foot of Canal Street, New York City. © Keystone Views.

UNDER THE RIVER BACKWARDS

Cable Laying with Motor Truck in Tunnel Presents Difficult Problem

KEEPING up with the ever-increasing telephone needs of New York City is a tremendous undertaking. That the New York Telephone Company is alert and equal to the task is evidenced by the accompanying photographs, showing how, in the absence of transit facilities, a cable was laid in a new tunnel under the East River, 100 ft. below the street surface. At the present time there are three major submarine cable crossings, but on account of the danger from ships' anchors and other marine troubles it was found advisable to place future cables in tunnels.

Under the East River is the beginning of a new subway, and, although it is only a hole in the ground at present, the telephone cable has been placed in it. With no suitable power in the tunnel, the problem of getting the cable through the tube presented unusual difficulties. There was but one means of entrance to the tunnel for cable installation, and that was through

the steel and concrete caisson or shaft at North Seventh Street, Brooklyn. It was decided that a 5-ton motor truck equipped with a power winch could do the trick. The truck, after being stripped of the cab and side racks and drained of all oil and gasoline, was lowered by a derrick with a 55-ft. mast and a 70-ft. boom, nose first, to the tunnel floor, 100 ft. below street surface.

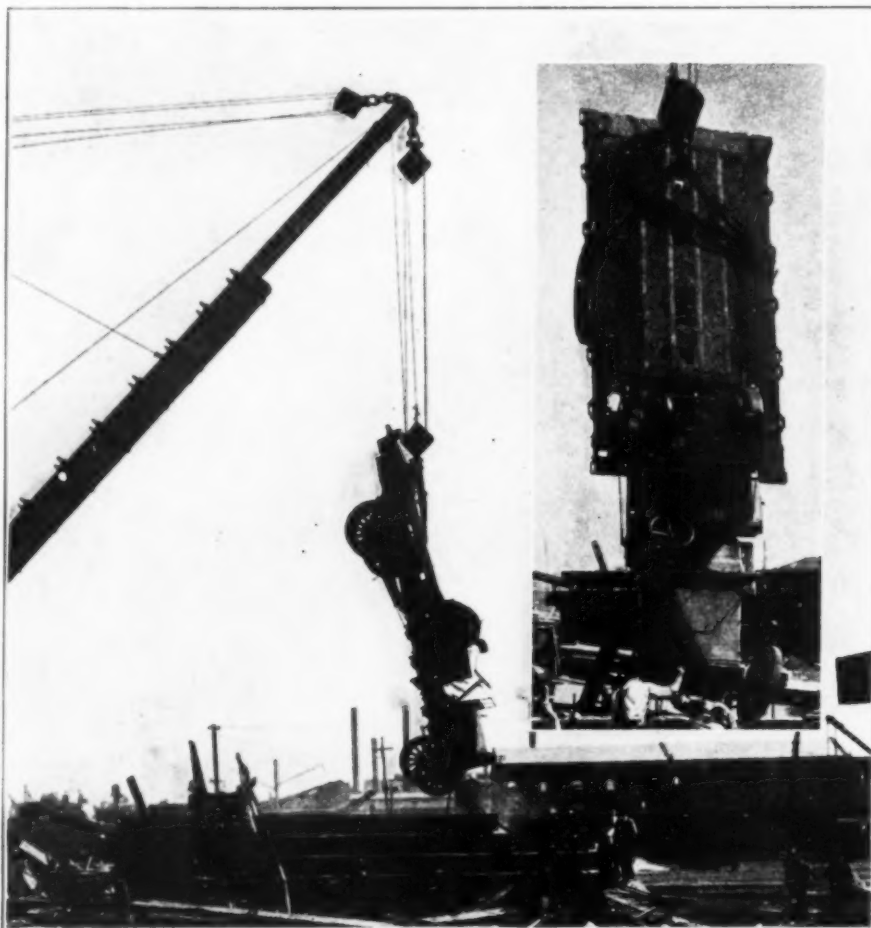
The top shaft opening measured 7 ft. 6 in. by 24 ft., but compressed air pipes, steel reinforcing trusses and other obstructions reduced the size of the opening until there was only 1 in. of clearance on all sides of the truck. When the front end reached the floor it was necessary, while suspended from the boom, to give the truck a quarter turn before lowering it on all wheels a hair's breadth at a time with the front of

the truck facing Brooklyn. It was a pretty ticklish job.

The first job was to deliver the necessary reels of cable at various points in the tunnel. This was accomplished by running the truck backward to the New York end, unloading it there and returning forward to Brooklyn for another load. It was impossible to turn around in the tunnel. This process was repeated

until all of the reels were distributed.

The pulling of the cable then was started, beginning at the Brooklyn end. Complete installation of 13,976 ft. of cable was made in 5 hr. and 57 min. As each reel was emptied of its cable it was necessary to roll the empty reel ahead of the truck to clear the roadway in the tunnel so that the truck could move backwards between the manholes. When all cable had been run, all empty reels were grouped at the New York end of the tunnel, from which point they were hauled the following day and hoisted to the street sur-



LOWERING A 5-TON MOTOR TRUCK INTO THE BROOKLYN SHAFT OF TUNNEL UNDER EAST RIVER. THE INSERT SHOWS A CLOSEUP OF THE TRUCK ENTERING THE SHAFT.

face, two at a time, with the derrick.

The use of this tunnel will result in a saving in trunk cables amounting to about 48,000 ft. of cable when Brooklyn circuits are routed through it during the early part of this year. When the construction of this tunnel under the main contact was rapidly nearing completion it became apparent that any cable placed for use in 1922 would probably have to be installed before September 1, 1921, after which date the work under the railway contractor, including laying the roadbed, ties, transit rails and third rail, would be started. This work probably will require a year, during which it will be very difficult, if not almost impossible, to place any telephone cables in the tunnel.

Cables could not be effectively used in the tunnel prior to the time when it would be free and clear for their



THE TRUCK IN THE TUNNEL READY TO START UNDER THE RIVER WITH ITS LOAD OF CABLE.

installation in a routine manner with the aid of electric power and train service. It therefore was decided to install 4 cables of the following sizes: One 1212-pair 24-gage cable; one 909-pair 22-gage cable, and two 606 pair 22-gage cable, special insulation.

To install the cable in advance, without the assistance

of the motor truck, would have been next to impossible.

That the natural evolution of the telephone system would call for a cable designed for a greater traffic and that this demand should occur at the same time and location as the need for the tunnel itself is fortuitous. The tunnel will be finished this year.

EMBELLISHING CONCRETE SILLS

WALTER O. LLOYD is a contractor and builder of Poughkeepsie, New York. On his work he has occasion to use a considerable amount of concrete sills and artificial stone and the method he uses to obtain a high class finish is interesting. When mixing the concrete he places granite or marble chips made up with white Portland cement in the facing to a depth of about 2 in. After curing, a stone cutter pitches the rock face, which brings out the texture and gives a pleasing appearance.

BEAUTIFYING HIGHWAYS

THE question of beautifying highways by planting trees and shrubbery is one that is being tackled in California. The Monterey Tree-Growing Club has undertaken in some localities the organization of clubs, of high school students and of citizens in general for the purpose of raising money for setting out ornamental trees along highways. Recently the club presented to the California Highway Commission 1000 trees of several kinds, most of which will be set out in Yolo, Sacramento and Tulare counties.

SUBWAYS COMPLICATE CONSTRUCTION

SOME of the unusual difficulties which a contractor encounters in excavation work in New York City are well illustrated by the accompanying photograph which shows the excavation for a twenty-two story office building in Pershing Square directly opposite the Grand Central Terminal. At this point is an important junction of the New York subway

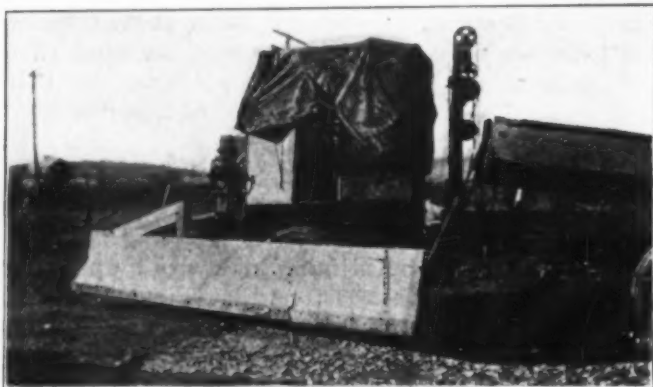


system and the contractors in addition to the usual difficulties had to take that fact into consideration. The subway itself runs through the center of the excavation and in the background may be seen two covered entrances for the passengers. When the building is finished access to the subways will be gained through the basement. The Thomas Crimmins Contracting Co. is handling the excavation work.

VIRGINIA HAS ECONOMICAL SNOW PLOW

THE Virginia Highway Commission has been using a snow plow this winter designed and made by P. J. Moore of the Equipment Division. The illustration shows one of these plows attached to a four-wheeled drive truck.

As may be seen in the photograph, it is a V-shaped



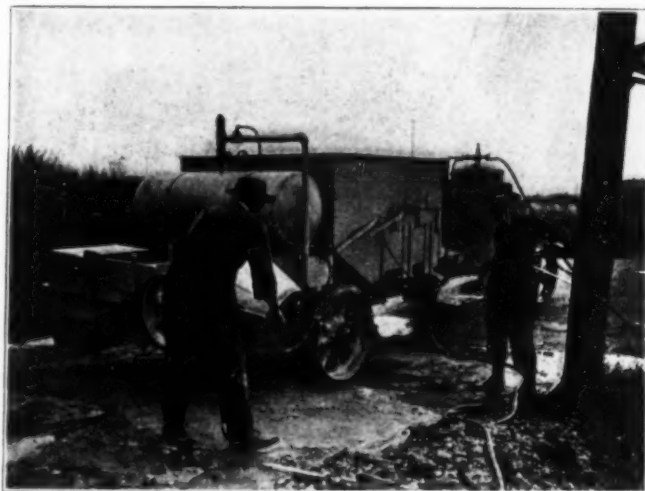
plow and cleans a width of 14 ft. in one trip. It also is possible to reduce the width of the plow from 14 ft. to 10 ft. by the folding in of the 4-ft. wings at the sides which operate on 10-in. strap hinges. Another clever feature is the use of an old automo-

bile wheel which keeps the plow just far enough off the ground. Chains are attached to each side of the truck frame from the plow to steady it and to prevent it from swinging in drifts where the snow is deeper on one side than on the other. In order to raise the plow by the use of the truck hoist when running light, two other chains are fastened to the body of the truck.

During a recent storm the truck shown left headquarters, made a trip of 180 miles, clearing snow all the way on the outbound trip and on part of the return trip, returning to headquarters only 46 hours after leaving. The cost per mile on this job was only 86 cents, which included rental of truck, pay of two operators and their expenses. The outfit can be operated so economically that it pays to run light for a distance of about 30 miles in order to clean a 10-mile strip of road. The initial cost of the plow was approximately \$60.

A TRUCK OF ALL TRADES

A HIGHWAY maintenance truck, which apparently has all the equipment and paraphernalia used in the upkeep of all classes of streets and highways, is being tried out by the Board of Supervisors of Kern County, California, and is shown in the accompanying



illustrations. The truck is equipped with a rotary concrete mixer driven by an auxiliary shaft from the transmission; combination material bins having a capacity of 1000 lb. of cement, 1 cu. yd. of sand and 2 cu. yd. of gravel or rock; tar or road oil heating tank with gas burners having a capacity of 50 gal. and a syphon nozzle for spraying hot tar or oil under pressure with hose. Part of the equipment is used in repairing breaks in reinforced or plain concrete, macadam or other kinds of streets. The cement compartment has a steel watertight cover. Pneumatic jack hammers are provided to break up the concrete and a pneumatic air jet is used to blow out the refuse.

Just back of the combination material bins is a 168-gal. water tank, the contents of which can be withdrawn by gravity or under pressure. On the rear is a centrifugal pump with a self-priming device and a suction hose for refilling the water tank from wells or rivers. This hose can also be used for pumping out caissons, sewers, manholes, etc.

The truck also is equipped with an air compressor operated by a belt from the forward drive shaft with a capacity of 80 cu. ft. per minute. On the right side of the truck, just back of the cab, is a large air receiver fitted with a safety valve, hose connections, etc. In addition to cutting out concrete and asphalt with pneumatic chisels, air is used for many other purposes, such as spraying trees and shrubberies in parks, digging post holes with the pneumatic post hole digger, etc.

Other equipment carried by this truck includes a 5-gal. paint tank on wheels which is used for painting and fireproofing; a large grading plow to be pulled by a side arm arranged alongside the cab and a drag or grader for beveling, shouldering up, rolling or draining the right-of-way; a draw bar attachment for hauling trailers; a power driven niggerhead winch and steel wheelbarrow; a 10-ton jack; 200 ft. of 1 in. manila

rope, a 26-ft. chain, steel stencils for lettering highways, 3 shovels, 2 picks, 1 large sledge, 2 crowbars, 10 red lanterns, 10 "At Work" signs and 10 red flags.

Stanley Able, Chairman of the Board of Supervisors, is responsible for the idea of this maintenance truck which is now being tried out.

A CORRECTION

IN the January issue of *Successful Methods* on page 12 in an article about the resurfacing of Michigan Boulevard in Chicago, a statement was made that hot tar was spread on the asphalt and a squeegee consisting of finely crushed rock was spread on the tar and rolled into the asphalt. This statement was incorrect as no tar was used on this job, asphalt being the only bituminous material used throughout the work.

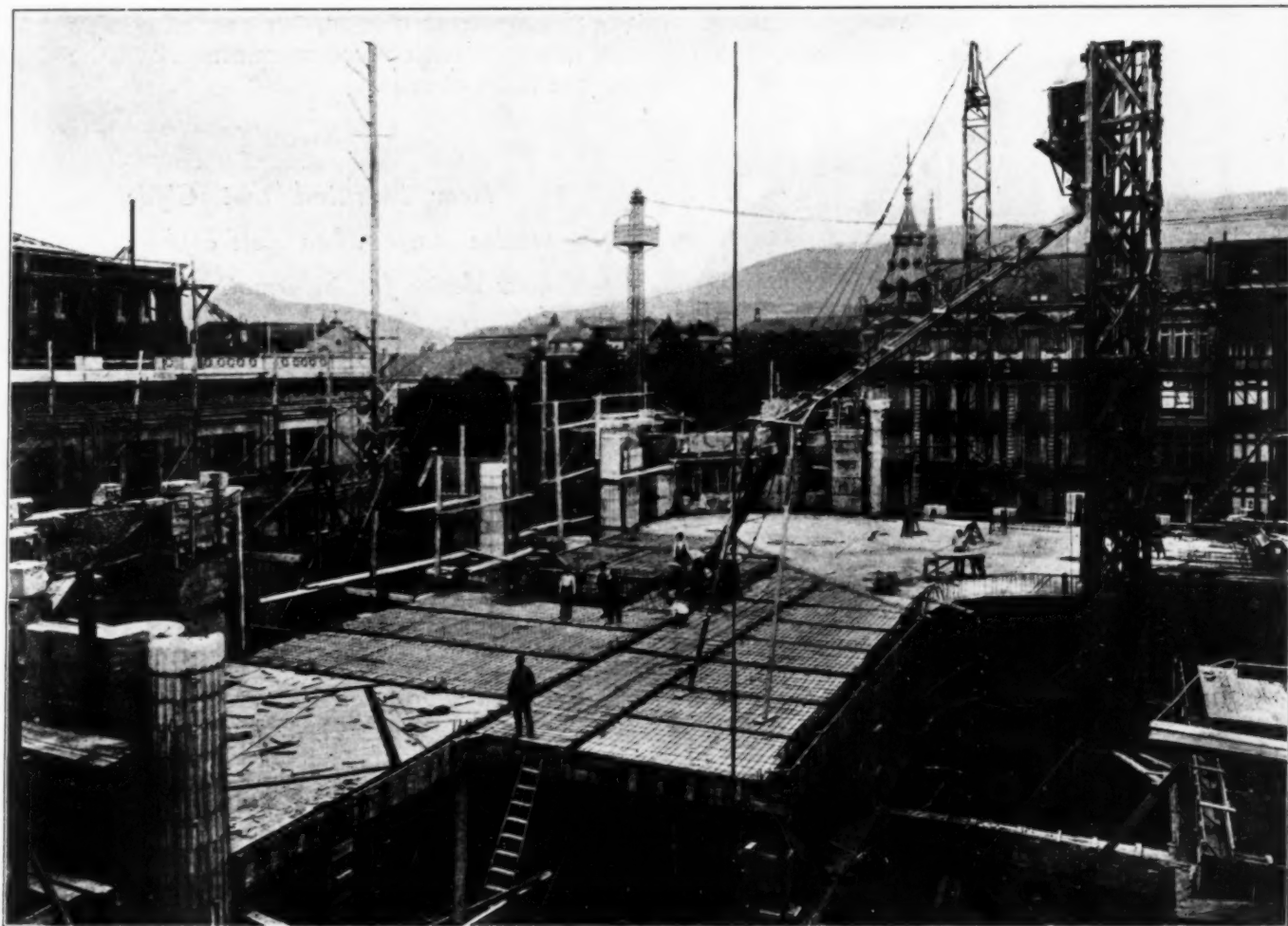
AMERICAN MACHINES IN SPAIN

AMERICAN methods and machines are in use in the construction of a new building for the bank of Bilbao, Spain. The competition for this job was keen and José and Eduardo Anduiza, who obtained the contract at an unusually low figure, planned to use modern methods in the work and are making good.

The building is ten stories high and has 1300 square meters of space. The chuting tower is so placed

as to take care of the entire job and with the forms in place it has required three days per floor to place the concrete, an average of 55 cubic meters or 72 cu. yd. being placed daily.

Three floors of the building are below the street level and will be used for the vaults. The division walls of these vaults are 70 centimeters thick and steel reinforced. The total amount of concrete in the building is 8700 cubic meters or 11,380 cu. yd.



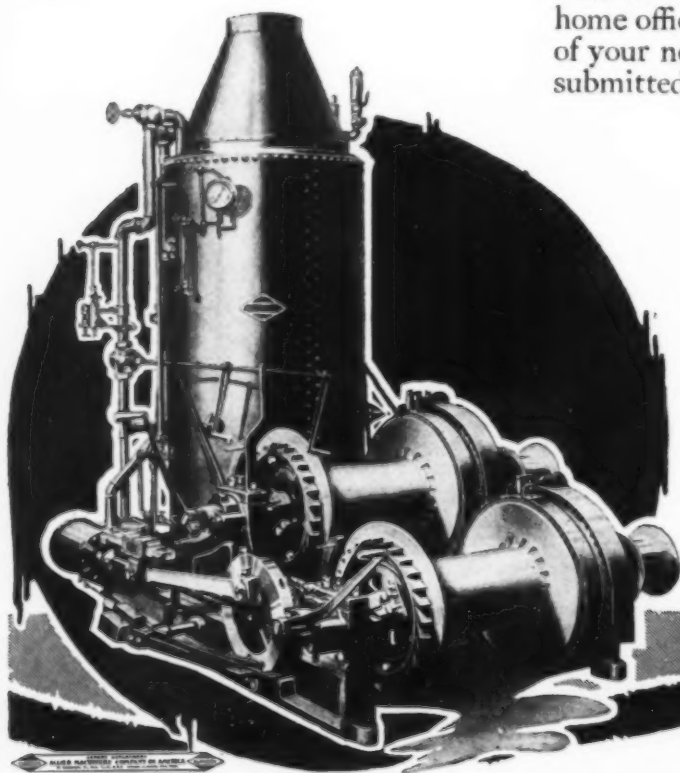
Reducing Costs

For several years during and following the war, cost of production was a sadly neglected factor in the operation of many manufacturing plants.

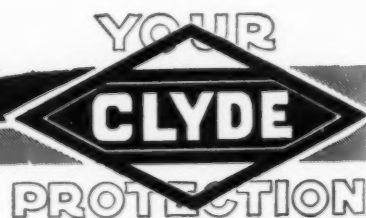
During the past year, this condition has awakened many producers to a realization that they must reduce production costs or face bankruptcy.

The Clyde Line of hoists, derricks and excavators has proven itself to hundreds of contractors and manufacturers as one of the safe methods of assuring themselves of a profit. Actual performance records supplied to us by users of the Clyde Line are convincing proof of this statement.

The Clyde has a cost-cutting machine for practically every outdoor operation about a manufacturing plant, or a construction project. A Clyde specialized salesman will call if you will put your problems up to the home office or your nearest branch. A careful survey of your needs together with recommendations will be submitted to you without cost.



Bear in mind that Clyde service starts when you express your desire for information and it continues throughout the life of the equipment.



THE CLYDE LINE

Steam Hoists
Steel Derricks

Electric Hoists
Excavators

Gasoline Hoists
Traction Cranes

Belt Hoists
Blocks and Sheaves

Derrick Fittings
Logging Machinery

Increasing Profits

Business today is on the up grade.

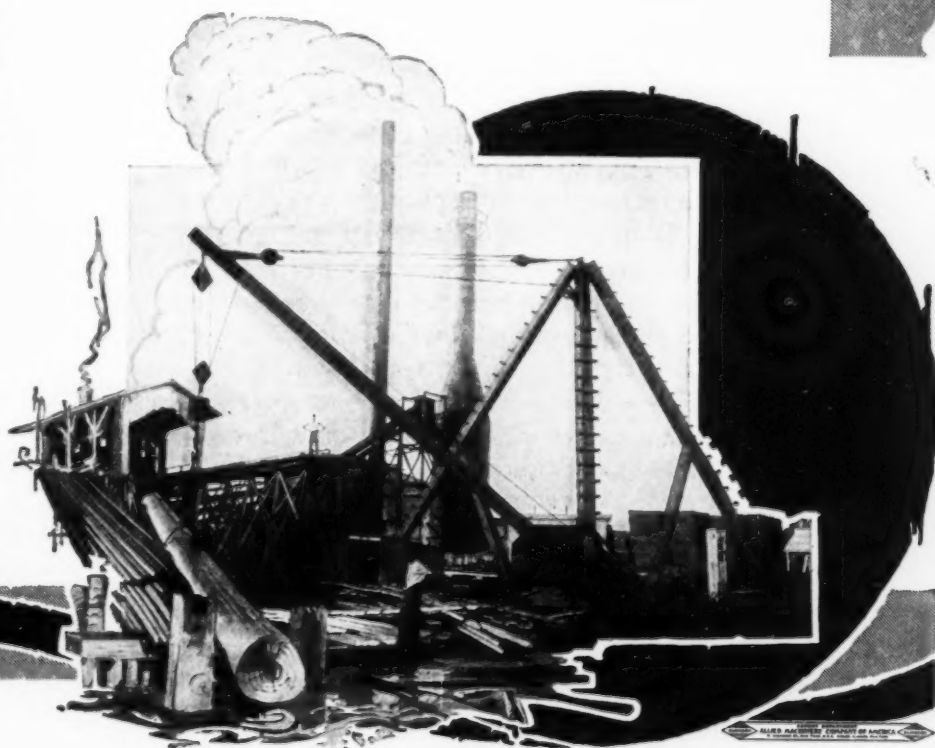
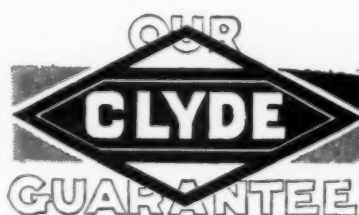
Look about you and note the new construction work and the factories which are showing signs of life. Six months ago conditions were bad. Now they are better and will continue to improve throughout the year.

And business has again become competitive. Wide awake executives are studying cost sheets and are devising methods for increasing profits by reducing costs. Advancing selling prices is a very unpopular pastime at present.

Profits and reserves must be accumulated through better manufacturing and construction methods. The Clyde line of hoisting and excavating machinery has proven itself with many manufacturers and contractors throughout the world. It will prove itself to you if given the opportunity.

Literature describing any portion of the line will be sent upon request or you may have a copy of the Big Red Catalog if it will be of use. It is practically a text book on big outdoor equipment.

The illustration herewith shows a Clyde derrick working for Kyle Lumber Company at Franklin, La., pulling logs out of the mill pond.



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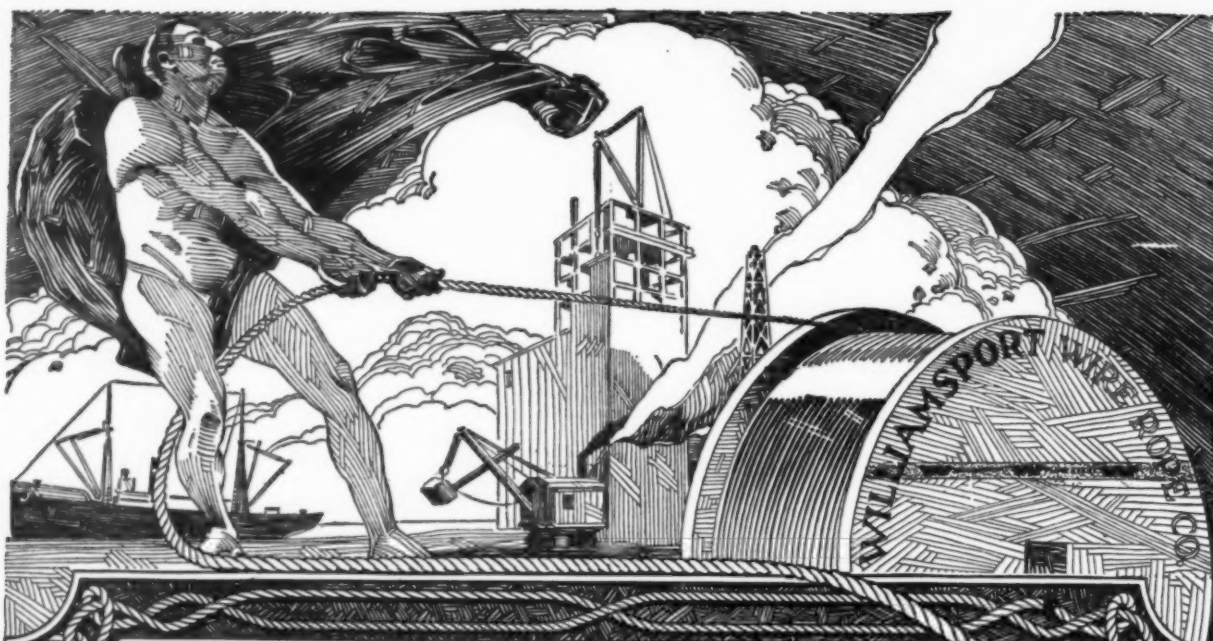
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Don't say that we said Red Edge will never wear out — it just seems that they won't

CITY OF WENATCHEE

STATE OF WASHINGTON

December 15th, 1921

Hofius Ferris Equipment Company
Spokane, Wash.

Gentlemen:-

Pursuant to your request for a dozen of the Red Edge Picks, we are shipping to-day as near a dozen as we can possibly get together, as we have been lending these picks to contractors and do not know whether we can get that many together or not, and I have this to say regarding the picks:

We have given these picks the hardest use of any lot of picks that we have ever had on the job for this reason. There has been considerable street improvement work in this city this summer which has made it necessary for us to lower practically all of the water mains in all of the streets improved. It is impossible or impractical to blast rock in a trench where there is a water main, so that instead, when we encountered rock under the main, we used your RED EDGE PICKS to pick them out and believe me, some of it was pretty hard work. We have never had any of these picks sharpened and we have used them constantly since the first of July. We cannot say too much in favor of the material in these picks and the same thing is true of your shovel. We never break or wear one of them out.

Yours very truly,

(Signed) CHAS. T. WHITE,

Water Superintendent.

CTW/DED

Whoever wants to try to make the "most" shovels and picks in a day can do so, we are going to continue to make the "best" shovels and picks every day.

Every day they are used the cost of operating a shovel and pick is twice the cost of the shovel and pick. Ever think of that?

THE WYOMING SHOVEL WORKS

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Conveyors For Unloading Cars



For unloading cars Barber-Greene Conveyors can equal or better the capacities handled by cranes or similar machines. And due to their low initial cost and small upkeep they offer the most economical means of unloading cars.

On the Rome-Morgan road, E. J. Inman, Ashtabula, Ohio, replaced a $\frac{3}{4}$ -yd. crane with the conveyor shown above. Six cars unloaded in one day was the best the crane could do, and it could only average four. The Barber-Greene Conveyor unloaded a maximum of twelve cars and averaged ten.

One move of five miles was made by the conveyor. The set-up as shown was completed in two days including the rebuilding of the track hopper. Note that the congested quarters do not interfere with the operation of the conveyor.

Mr. Inman says:

"If I get certain contracts I am after, I am going to put in three or four of these machines and show some of these people what speed really is. If I had had this conveyor when I started the job, I would have been finished six weeks ago."

The contractor who wishes a machine with high capacity and unloading ability that is economical both as to first cost and every-day operating cost, should use the Barber-Greene Conveyor. Our representatives near you can tell you which conveyor will solve your unloading problem most satisfactorily.

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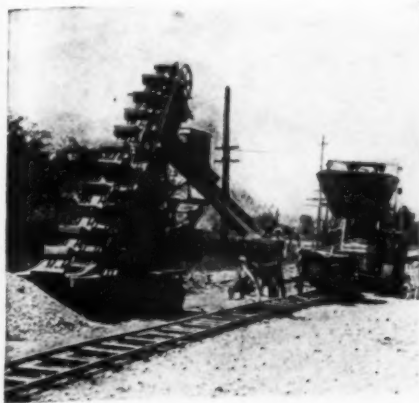
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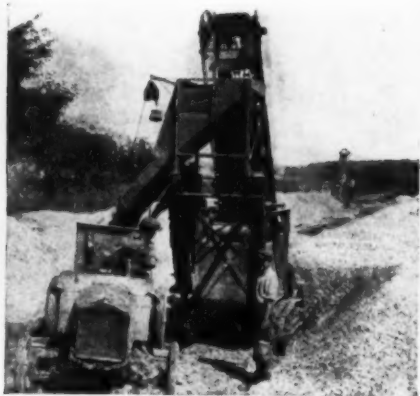
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Speed in pouring can be maintained if there is speed in handling materials. You can get speed loading sand and gravel by using Barber-Greenes.

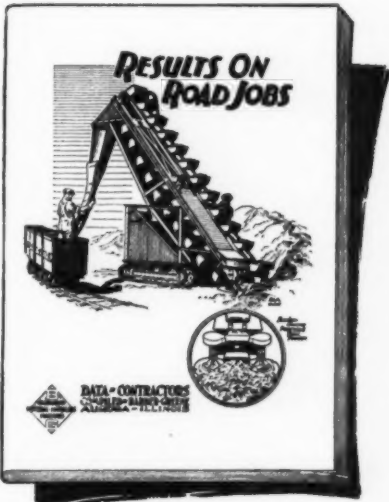
On every type of job the results other contractors have obtained with Barber-Greenes prove this. Brereton & Bauck, Emmetsburg, Ia., used a Barber-Greene to load gravel into their industrial cars. Mr. Brereton wrote:

"We are not working our Barber-Greene Loader to capacity for the reason that our industrial haulage outfit has a smaller daily capacity than the Barber-Greene."

In fifty working days the Barber-Greene loaded 12,500 cu. yds.

Using wheelbarrowmen and shovelers, J. J. Belotte was able to get only an average of 281' per 9-hour day. Then he added a Barber-Greene and a Ford and increased his mixer out-put by 23%.

These are only two typical examples of the results obtained by contractors using Barber-Greenes. You should have our booklet "Results On Road Jobs" which shows how Barber-Greenes were used on 24 typical jobs. This book is free. Just send the coupon.

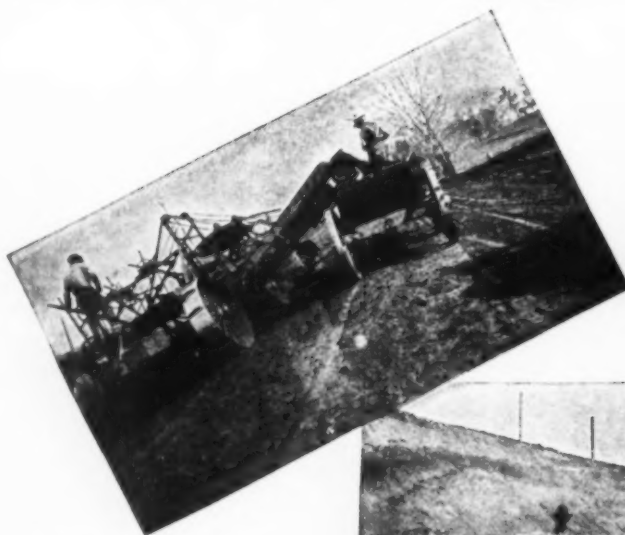


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Let Western Equipment Build Your Road



Western Elevating Grader and Dump Wagons grading a Road in South Dakota.



Concrete Road Work, near Duluth—Western Equipment with Industrial Haulage.



A "cut" in South Dakota Road work made with a Western Elevating Grader.

The Nation's Road Builder

THE Western Wheeled Scraper Company is the Nation's Road-builder, from the grading of the roadbed to laying the finished pavement.

Grading—For economy use the Western elevating grader and Western dump wagons, where their use is practicable; otherwise, Western small tools—plows, wheeled, slip or fresno scrapers, leveling with a Western blade machine.

Western small tools are practically standard everywhere. Contractors prefer them because they are built to last; their upkeep is small.

The improved Western elevating grader has reached the high-water mark in efficiency. You can use this Western machine with the most powerful tractor and expect yardage in proportion to the power given it. Rightly used with Western dump wagons, there is no more economical method of earth-moving; 1,500 wagon loads in one day have been reported.

Concrete Paving—Contractors have proved that under ordinary conditions on fairly good-sized contracts, Industrial Haulage, with Western Batch-Boxes and Car Trucks, is a money-maker.

Your layout and installation will make or break you. There is no need for guess work. Skilled and trustworthy advice is yours for the asking. Our engineers are at your service. Nearly a half-century of experience as the Nation's road-builder lies back of the Tools and Machines, called "Western."

WRITE TODAY. Let's get an early start

Western Wheeled Scraper Co.

*Earth and Stone Handling Equipment
Aurora, Illinois*

Western
That's Why

Uninterrupted Operation Insures Profits On Contracts

In estimating on construction work of any nature your most indefinite factor is delays—and yet delays often turn your profitable contracts into losses.

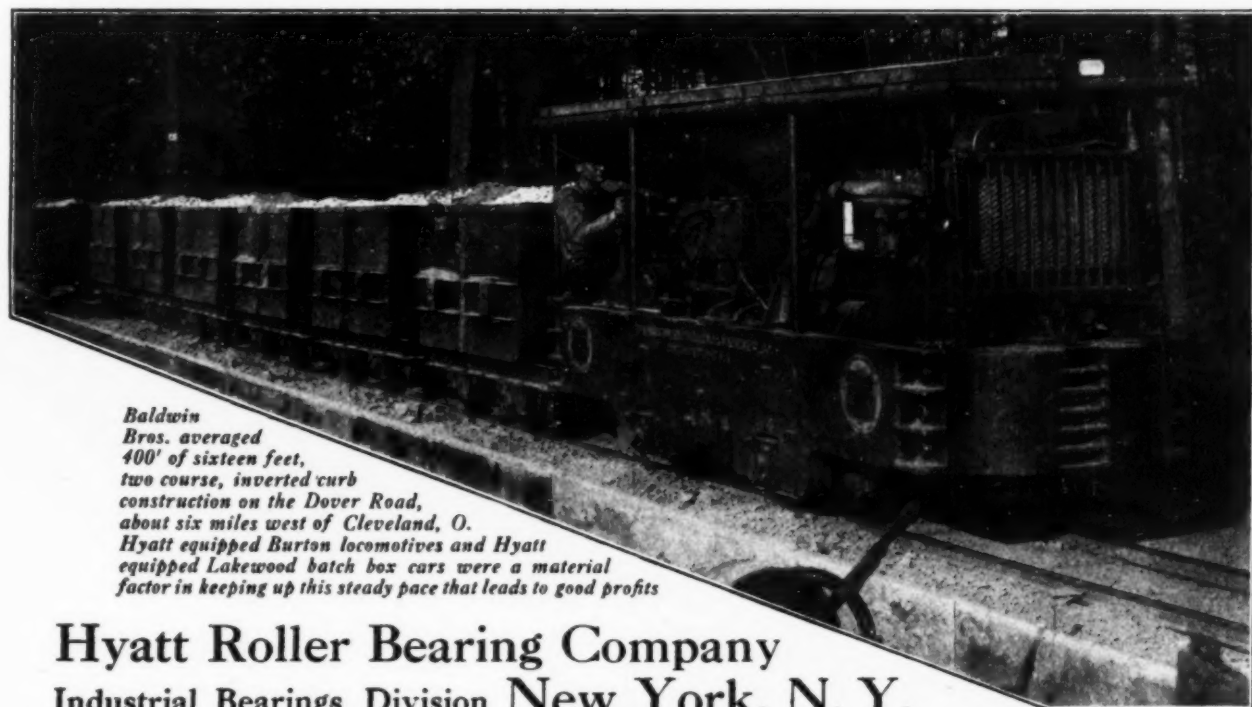
You can guard against profit cutting delays by using equipment so designed and so constructed as to operate continuously for years without breakdowns or other delays.

You will find that the use of Hyatt roller bearings on cars, locomotives, mixers and other equipment removes a source of delay and trouble—the ordinary friction bearing. Hyatt bearings are strongly constructed to give full service throughout the life of the equipment without adjustment or replacement.

The true rolling motion of Hyatt bearings which eliminates destructive friction and the tough chrome-vanadium steel rollers are responsible for their durability—and therefore for the dependable operation of equipment in which they are used.

The grease in the Hyatt bearing is constantly spread over all bearing surfaces by the action of the rollers, and there is sufficient space so that it is only necessary to grease Hyatt bearing equipment once a season.

Don't struggle along with unreliable, delay-causing equipment—specify Hyatt roller bearings on your locomotives, cars and mixers.



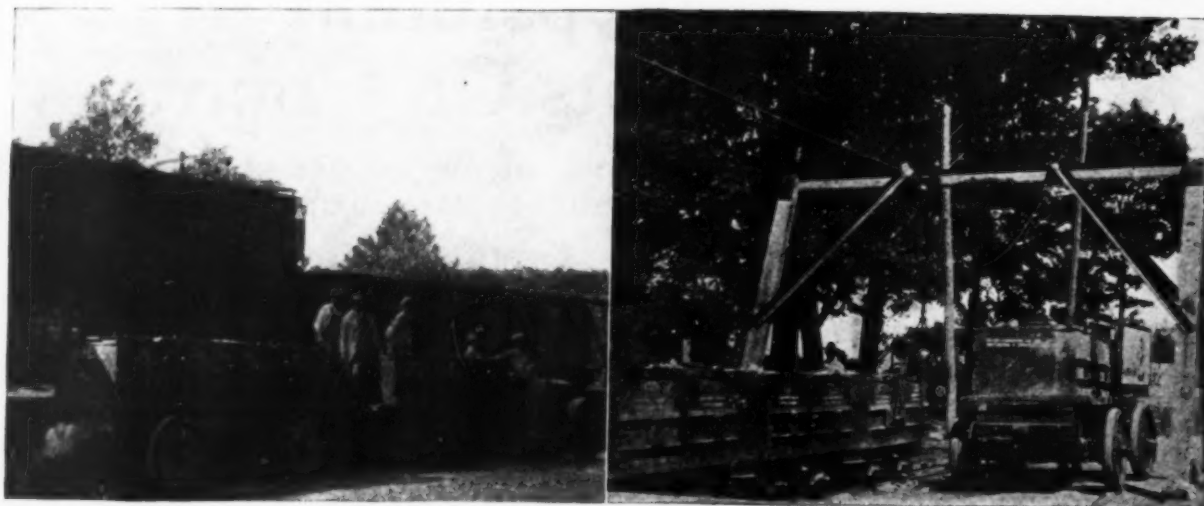
Baldwin Bros. averaged 400' of sixteen feet, two course, inverted curb construction on the Dover Road, about six miles west of Cleveland, O. Hyatt equipped Burton locomotives and Hyatt equipped Lakewood batch box cars were a material factor in keeping up this steady pace that leads to good profits

Hyatt Roller Bearing Company
Industrial Bearings Division New York, N. Y.

Motor Bearings Division, Detroit
Tractor Bearings Division, Chicago



Pacific Coast Division
San Francisco

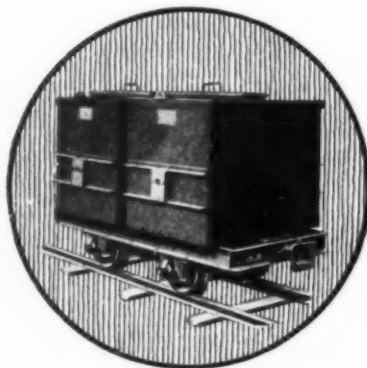


A Good, Money-Making System For Many Paving Jobs

Royer-Ferguson, High Point, N. C., have their unloading yard on a railroad siding in the center of the city. Batches are made up in Lakewood Batch Boxes at the yard and hauled one mile by trucks and trailers over the city's paved streets. At the city limits the boxes are transferred to Lakewood narrow gauge railway for delivery to the mixer.

It's a good, money-making system, applicable to many jobs. Let us tell you more about it.

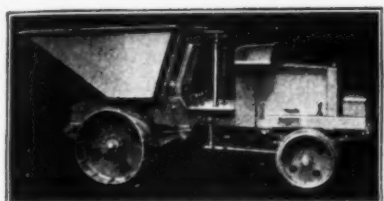
The heavy steel Lakewood Tip Over Batch Boxes are the ideal ones, for many reasons, for use with this system.



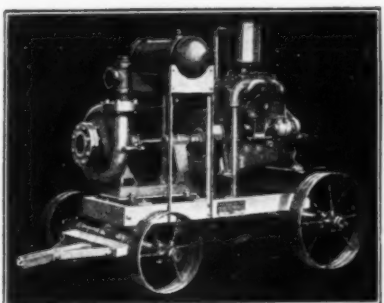
The Lakewood Engineering Company. Cleveland U.S.A.

CH&E.

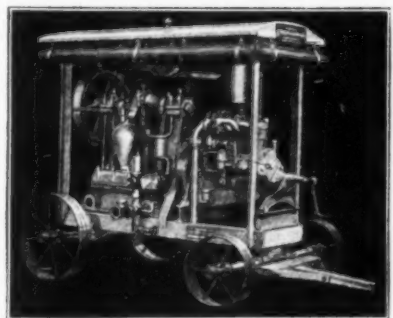
Contractors' Equipment



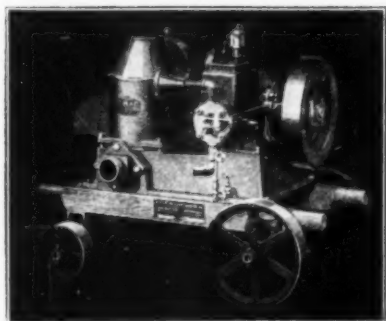
C. H. & E. Tractor



C. H. & E. Centrifugal Pump

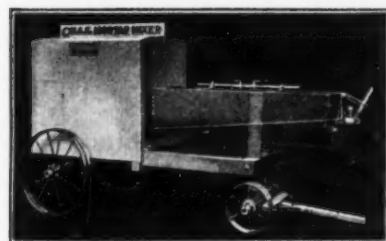


C. H. & E. Triplex Pump

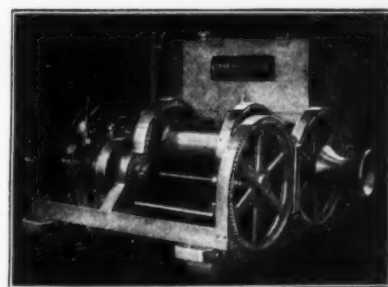


C. H. & E. Bilge Pump

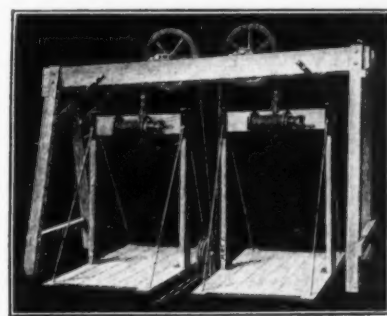
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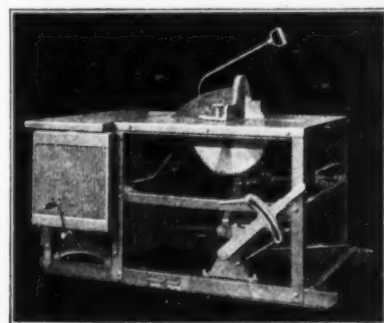
C. H. & E. Mortar Mixer



C. H. & E. Builders' Hoist



C. H. & E. Material Elevator



C. H. & E. Saw Rig

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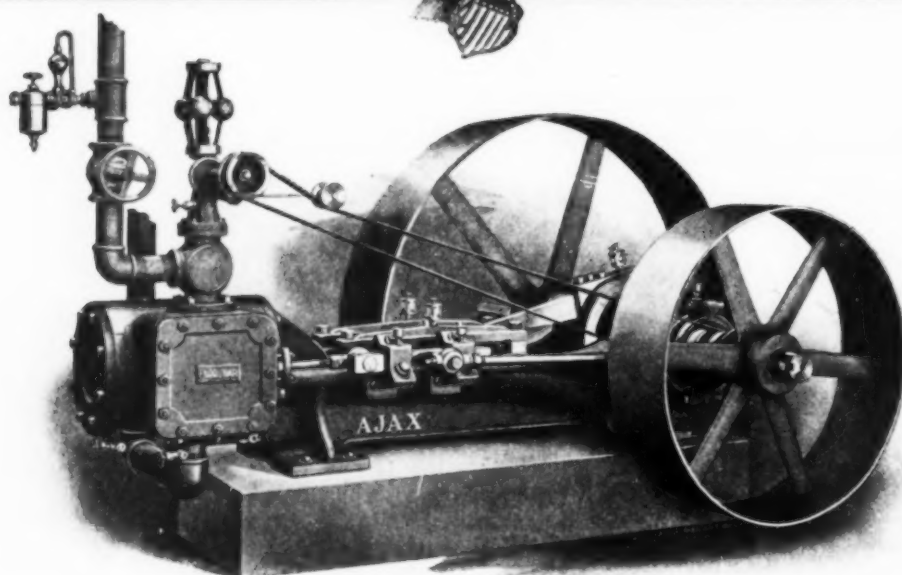


C. H. & E. Manufacturing Co.
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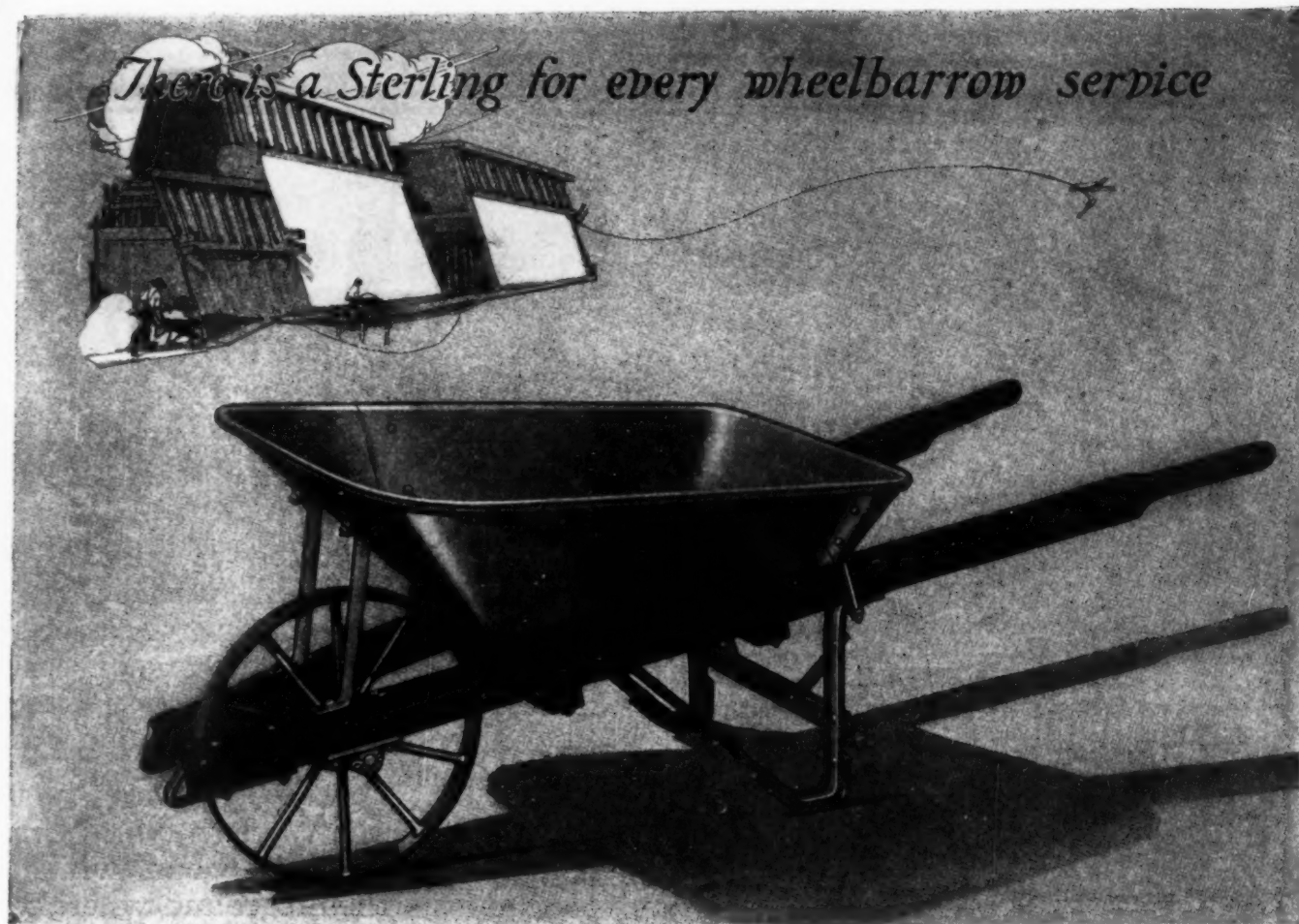
A. B. FARQUHAR CO., Limited, York, Pa.

BOX 478



A. B. FARQUHAR CO., LIMITED

EXPORT DEPARTMENT
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No. 35

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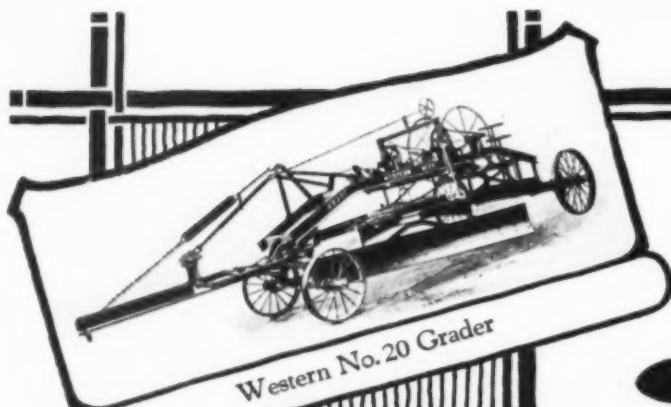
Sterling Wheelbarrow Company

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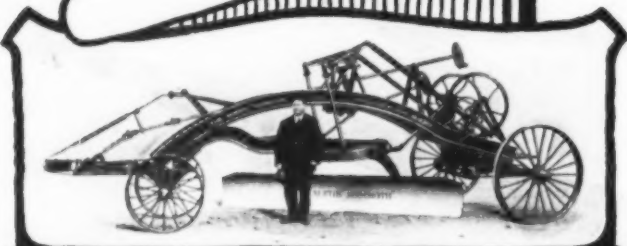
MILWAUKEE, WIS.

CANADIAN AGENTS: MUSSENS LIMITED, MONTREAL, TORONTO, WINNIPEG, VAN COUVEY

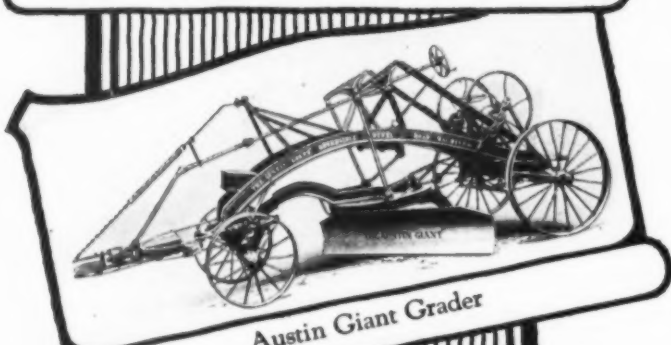
DETROIT
CHICAGO
ST. LOUIS
SPOKANE



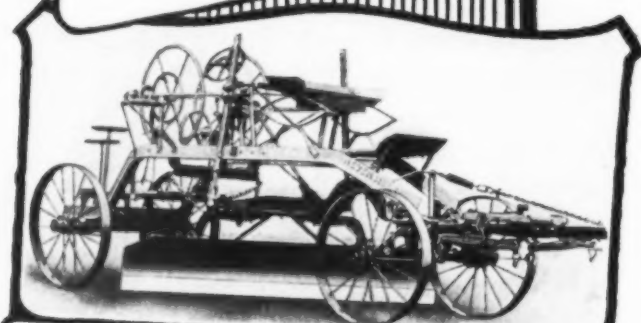
Western No. 20 Grader



Austin Mammoth Grader



Austin Giant Grader



Standard Aurora Grader

A-W for Construction

START with the "Standard" Austin, Western and Aurora Graders, continue up through the Specials, the Giant and the Mammoths to the Western No. 20, the largest of them all, and you will find in some one model exactly what you are looking for.

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Elevating Graders
Dump Wagons
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Road Scarifiers

Road Drags
Wheeled Scrapers
Drag Scrapers
Road Plows
Ditchers
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The Austin-Western Road Machinery Co.

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THE two Western Midgets and the Little Western Grader meet all your maintenance needs. For the reconstruction of old road surfaces, no matter how hard, there's the Austin Rip-Snorter, combined scarifier and grader.

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General Catalog 21-X illustrates and describes the full A-W line.

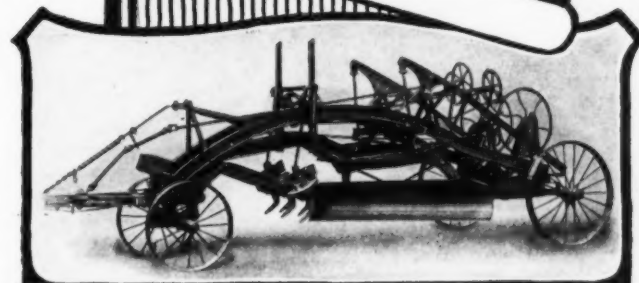
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Atlanta	Kansas City	New York City	San Francisco
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Columbus	Los Angeles	Philadelphia	Topeka
Dallas	Louisville	Portland, Ore.	Wahoo, Neb.
Denver	Nashville	Richmond	



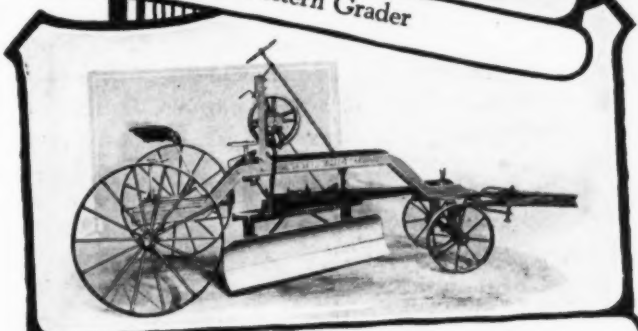
Western No. 14 Scarifier



Austin Rip-Snorter



Little Western Grader



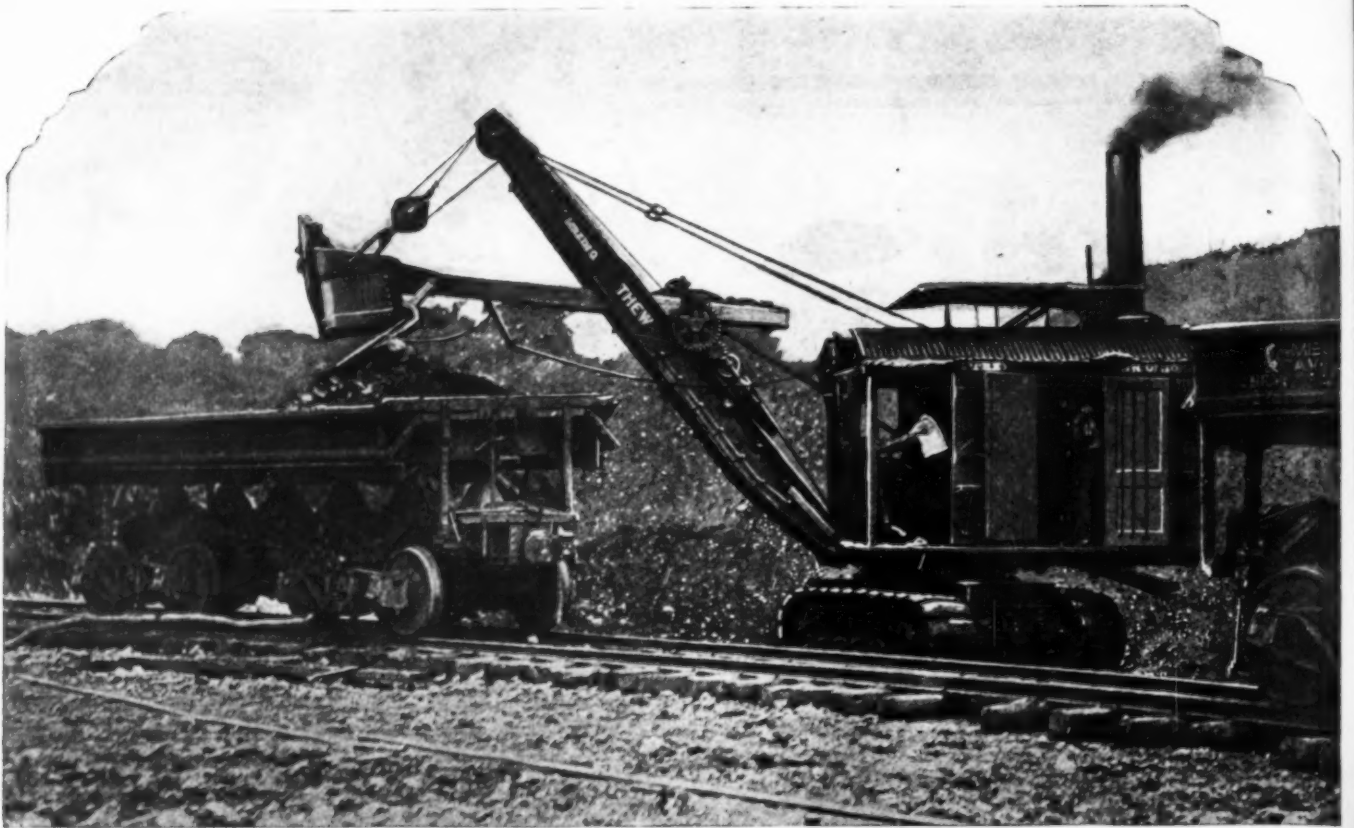
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Some output for a shovel.

This $\frac{3}{4}$ yd. Thew dug and loaded that much material between April and October last year. The job was down at the Panama Canal where it is hot enough at times to burn out any ordinary shovel.

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Write for Bulletin 111 and get the facts about Type O shovels and cranes.

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Thew

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